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Combined Safety Valve and Low-Water Alarm.

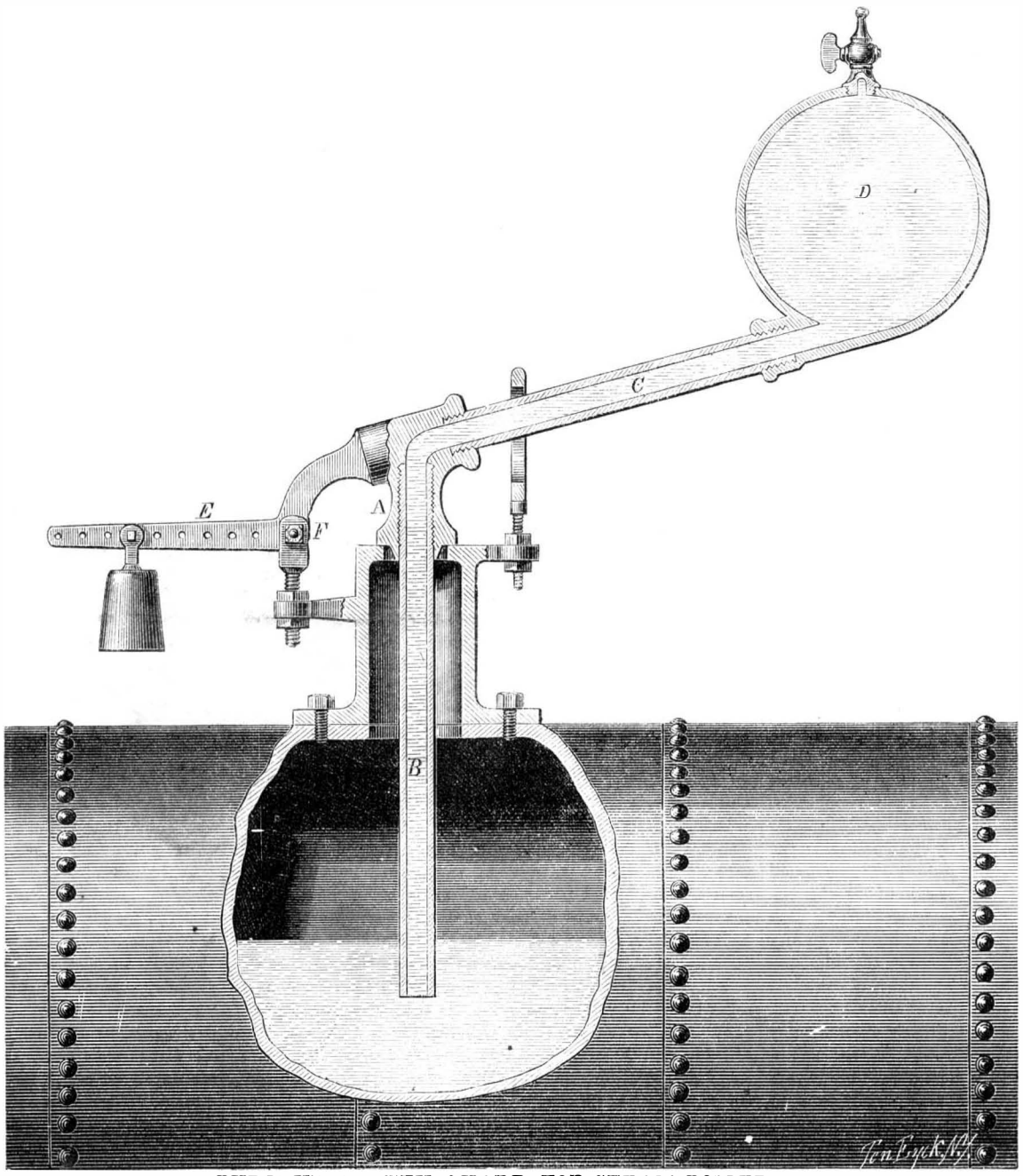
The dangers arising from too low water in boilers are scarcely less than from too high steam. It was long ago seen that an escape valve, adjusted to relieve the boiler from any excess of steam above a fixed pressure, was a prime necessity as a measure of safety in the use of steam; but while the safety valve has thus been an accompaniment of boilers almost from the earliest period in the history of steam, the application and adoption of automatic low-water detectors and alarms, are comparatively recent.

It is not our purpose to discuss the general utility and desirability of reliable instruments of this kind in the present article; we have too often given expression to our views on this subject to render it necessary to repeat them. Our object is to describe a device of the kind under consideration, of which we give an engraving, and which differs from many low-water detectors, in that it is a low-water detector, alarm, and safety valve combined, each of its functions being independent of the other.

The safety valve is made, as shown in section at A, with a flat annular face, its upper portion being nearly at right angles with the vertical part, and a tubular opening passes through its entire length.

Into the lower part of the bent tubular opening is screwed the vertical pipe, B, and into the upper part the inclined pipe, C, having at its outer end the hollow sphere, D. The sphere, D, has a pet cock at the top to allow the efflux of air when the valve is first adjusted to work. On the opposite side of the valve, A, from the pipe, C, projects a bent arm, E, pivoted at F, and carrying a weight by which the valve can be adjusted to the required pressure. The pipe, B, descends below the normal water level, as shown.

In adjusting this valve, the pet cock in the sphere, D, is opened, when the air escapes, and the pressure of the steam upon the surface of the water in the boiler causes the water to rise and fill the cavity. The weight upon the arm, E, is then set to counterpoise the weight of the water to the pressure it is desired to maintain. Any pressure exceeding the required pressure raises the valve and relieves the boiler. It will be also evident that as soon as the water falls below the pipe, B, steam will take the place of water in the pipe, C, and the sphere, D, and the valve will then open immediately. The sound of the steam, as it issues from the valve, will give the alarm, or a whistle may be employed if desired.



BURLEY'S SAFETY GUARD FOR STEAM BOILERS.

In this case the valve is opened by both the force of steam and the counterpoise, and a very wide opening being made the discharge of steam will be so copious as to be readily distinguished from the smaller escape due to pressure alone.

These valves have been tried and are highly recommended by many users of steam in Cincinnati and Columbus, Ohio. Two patents, dated respectively December, 17, 1867, and June 15, 1869, have been obtained on this device by Charles Burley, of Cincinnati, Ohio. A part of the right for the Eastern and Middle States will be sold. Address, for further information, Burley & Co., No. 84 West Third street, Cincinnati, Ohio.

PATENT RIGHT AND COPYRIGHT.

The following extract from an address by Mr. Cleland before the Liverpool Polytechnic Society, is a masterly reply to the sophistries of some of the modern enemies of the patent system:

As the opinions formed by Lord Derby, in his capacity of chairman of the committee of 1864, naturally carry great weight with them, at least until we see how partial was the evidence from which these opinions grew, it is worth while to take some pains to expose the fallacy as to the distinction between patent right and copyright, which he, in common with Mr. Macfie and others, has promulgated.

Lord Derby, then Lord Stanley, said "the difference is simply this, the obvious fact, that no two men ever did or ever would write, independently of one another, the same book; whereas it might happen, and often did happen, that two or three men, quite independently of one another, would hit upon the same invention. That alone establishes a distinction between the two cases." Obviously his lordship here speaks of patentable inventions; not mere ideas, suggestions, prognostications, or sketches; and his proposition is distinct enough, except for one slight ellipsis, which we will take the liberty to correct, as it deprives the proposition of that clearness which is so desirable in any statement that has to be formally discussed. He said "exactly the same book," and doubtless meant exactly the same invention. In this sense we will understand and endeavor to reply to him.

What is a book but the visible type, expression, or embodiment of the author's ideas? What is a patentable invention but the visible type, expression, or embodiment of the ideas of the inventor? As the author's ideas are the soul of the visible book, so are the inventor's ideas the soul of the visible invention. As the body that contains the author's ideas will vary indefinitely, according to the various minds of various authors, so will vary the body that contains the ideas of the inventor. We admit that two authors writing on the same subject must exhibit differences of arrangement, style, construction, grammar, etc., arising inevitably from the differences between themselves; so we must admit that two inventors, independently carrying out, expressing, or embodying the same ideas, will exhibit analogous differences in arrangement, style, construction, and what may be called the grammar of physics. That two inventors, working independently, should throw their ideas into a form of process "exactly" the same, is as improbable, and as inconsistent with what we know of human nature, as that two independent authors should write books in which there should not be even a difference of wording or punctuation.

As some difference, if it were only verbal or grammatical, would surely betray the independent authorship, so some difference in the members or details, if it were in nothing more than nails instead of screws, would certainly betray independent invention. Did time permit, it would be interesting to trace the analogies between machines and books in arrangement, logical coherence, construction, style, etc., but probably enough has been already said to show that the "obvious fact" on which Mr. Macfie, Lord Derby, and others rest their partiality to copyright is not a fact, and is by no means obvious, and that wherever the natural and necessary distinction between authors' and inventors' rights may lie, it is not where his lordship supposes he has found it. If it is replied that the book and machine are not meant in that straight, narrow, and mechanical sense, but rather the ideas which the book and machine express, I rejoin, that cannot be the meaning of the proposition, since it would cut the feet from the distinction which it desired to establish, it being well known that, in that sense, various authors have independently written the same book, and various inventors hit upon the same invention.

Mr. Macfie, comparing books with inventions, seems to think he has used a knock-down argument, when he says that if he buys a railway guide he is at liberty to make use of the information it contains, and to find his way by its guidance to any part of the kingdom; but that if he buys a specification, it only tells him of something which he is not at liberty to do. This is a curious example of the haziness of which I have so much complained. I would ask the author—Is your railway guide a free pass for any of the railways it mentions? Will it authorize you to run your private locomotive on the rails, or even to lay down another line alongside? You see there are three things to be named on both sides, to make the comparison just. On the one side, the town to which you wish to travel, your fare, and railway ticket. On the other, the end, the product or manufacture you want to arrive at, your royalty, and license.

To apprehend the nature of the bargain between the State and the inventor contained in patent law truly, let me remind you that to patent means to publish, or to inform the public of the subject patented. Letters patent are granted, not strictly for inventions as many seem to suppose, but for the publication of inventions, not for publication merely but for prior publication, and not purely for prior publication but for prior publication through a well-known channel formed for that express purpose, where the information given may be preserved for, and be always readily accessible to the public. Priority is an indispensable condition of the bargain. This condition has been objected to in the paper before us, and elsewhere by Sir Roundell Palmer and others, on grounds that seem to me as untenable as those of the objections to property in ideas. Here the State adopts the proverbial maxim that a "bird in the hand is worth two in the bush." It buys a caged bird in preference to a bird in the woods, and buys it from the first comer, because it knows no other. It wants but one bird of each species; a second would be superfluous. To drop metaphor—the Commissioners of Patents, as servants of the State employed to buy the knowledge of new inventions, offer inducements in the shape of letters patent for the earliest and fullest information. They are in darkness as to these new inventions, and they wait for the inventor to come and displace their darkness by his light.

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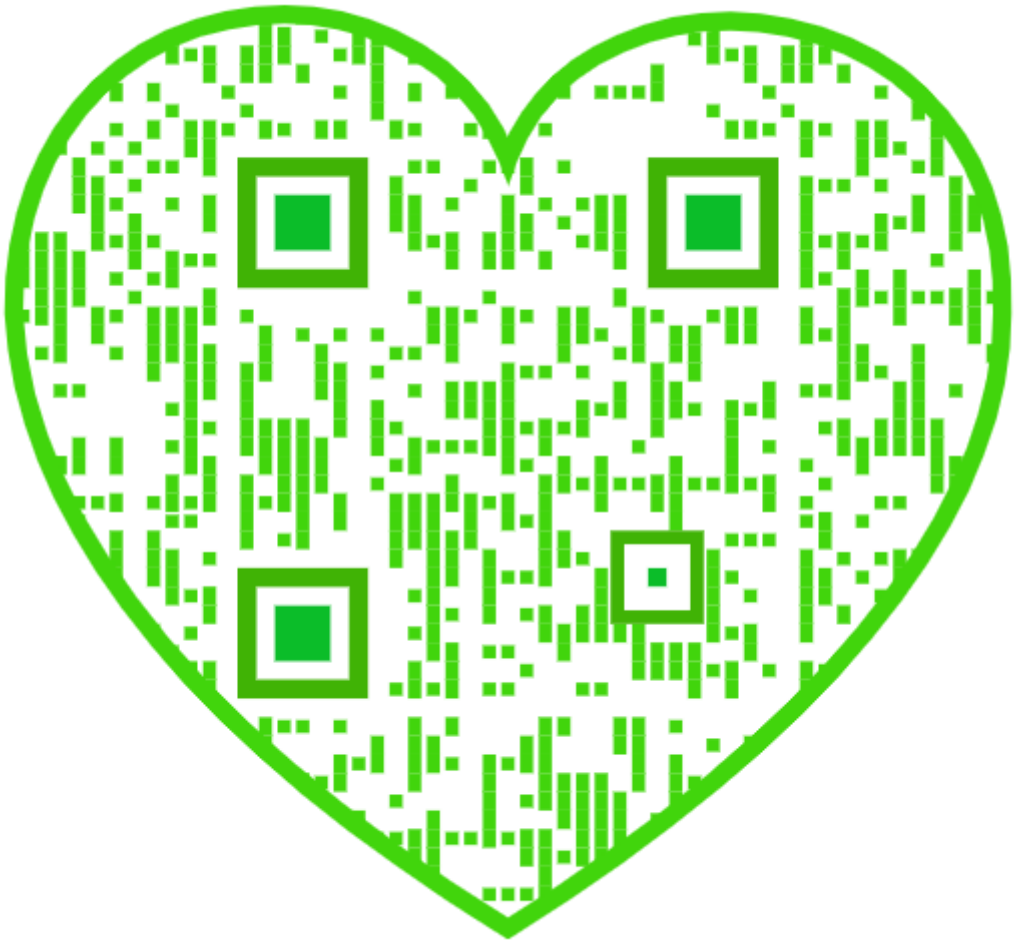

The first comer only can do them this service. Can you, B dispel darkness where no darkness is? Could you go about to enlighten the enlightened? The service you offer has been already performed by A, and is no longer possible to you.

But it is said your priority is of little consequence—your boasted originality is in general mere antiquity—your merit of anticipation is meretricious—the so-called invention over which you make such a cackling lay direct in the "path" of discovery and invention, and was sure to have been hit upon by those who were following hard at your heels. Mr. Lauder, in this discussion, in the instance of thermo-dynamics, to which he could easily have added many others, has given a severe blow to those fallacies. Did time permit, I would aspire to the honor of following in his footsteps, and of giving them the *coup de grace*. It would have been amusing, and perhaps instructive, to survey that wondrous but badly-paved road of discovery—itself, strange to say, quite a recent discovery—where inventions and improvements, great and small, are supposed to be strewn like boulder stones and loose Macadam, where the traveler must tread warily lest he agonize his corns against a wee improvement, or heedlessly stumble over a big invention, to the bruising of his shins and the imminent peril of his nose—that romantic pathway through an enchanted land where, according to our modern argonauts, wild geese, protuberant with golden eggs, waddle lazily along, actually inviting the passenger, with inharmonious voices, to put salt on their tails!

FUR SEAL FISHERY IN ALASKA.

[From Old and New.]

After a possession of two years, and with adequate means of obtaining information, the amount of knowledge of the territory of Alaska, and its resources, evinced in official government reports, is lamentably small; while the great bulk of our people have no ideas in respect to it outside of its name. Such being the case, I think it might not be uninteresting for me to give a short account of the great, and alas, only source of revenue, in Alaska—I mean the fur seal fisheries. It is not only on account of their connection with Alaska, that these fisheries are objects of interest, but from the fact that the habits of the animals are exceedingly peculiar, being wholly unlike those of any other creatures in the world; and also that the furs obtained there are at present in very great demand.

The southwest corner of the main body of Alaska is lengthened out into a long peninsula, and from the end of it the chain of Aleutian Islands extends almost to the opposite shores of Asia. These islands form the southern boundary of Behring Sea, which, for its stormy turbulenco, the shallowness of its waters and consequent destructiveness of its waves, and the comparative frequency of shipwrecks that occur upon it, is justly dreaded by sailor, merchant, and insurer.

In this sea, about three hundred miles northwest from the extreme end of the peninsula of Alaska, and entirely isolated from all other bodies of land, are two small islands, named St. Paul and St. George; they are so small, that if looked for on a large map they will be found only represented by mere dots. St. Paul, the larger of the two, is thirty-five miles north of St. George; the former is about fifteen miles long by six broad; the latter ten long, by four broad. They must have been at one time much larger, but being of old volcanic formation, they have gradually worn away, forming by detrition large and dangerous reefs, which, extending several miles into the sea, render it impossible for vessels to stay in their vicinity, except in fine weather; especially as at neither of the islands is there a harbor, and the only protection to be found in a storm is to get if possible on the lee-side of one of them.

From the shore, with perhaps a dozen exceptions on both islands, cliffs rise perpendicularly, varying in hight from fifty to six hundred feet. These are cut at places by the wind and rain into most fantastic shapes, and are the abode of countless myriads of sea fowl. The interiors of these islands are wild and desolate in the extreme, but are greatly diversified by hill and valley. The upper part is of rough, jagged, uncovered rock; so uneven is it that it is almost impossible to pass over certain portions of it without suffering greatly from laceration of feet. In the valleys the rock is covered by a thin layer of earth, which supports mosses, a few running vines, and in low damp spots a coarse grass: as for timber, there is not so much as a twig; the natives are therefore obliged to collect all that drifts to their shores to supply themselves with fuel and building material. These bleak cliffs and barren valleys are shrouded three fourths of the time in thick fog; for without this great dampness—as I will hereafter explain—it would be impossible for the seals to remain there during the season. Add to this, storms of such violence and duration as to render landing or departure from the shores an impossibility in winter, and in summer only practicable on an average two days in a week, and one may form some idea of the natural attractions of this part of our newly acquired possession.

There are eight beaches at St. Paul's, and four at St. George's, which, instead of ending abruptly at the foot of tall cliffs, rise gradually up into low hills. On these beaches, in the early part of May, the seals begin to assemble; first, a few "seacutchers," or old male seals, arrive; and taking upon themselves the office of scouts to the advancing army, go over all the ground. If much interrupted in their proceedings, they have been known to prevent the landing of seals on that beach during the ensuing summer; and for this reason they are permitted to wander at will. As time progresses, more arrive, both old and young, but almost entirely male, until the beaches fairly swarm with them; and the young and middle-aged are urged, from want of room, and by the ferocity of the "seacutchers"—who keep the water line wholly to themselves—back upon the adjoining hill sides. From the middle of May to the first of June, there is a constant influx of female seals, who, as fast as they arrive, are seized by the "seacutcher" upon whose feet of territory chance has brought them; he driving back, if he be able, any adventurous male seal who may wish to contest his right. If he is not able so to do, he is himself driven up the hill side, and loses not only the new comer, but all former conquests he may have made; for they are quickly absorbed into the victor's already crowded harem. In these struggles for supremacy, the brunt of the battle, as is the case with higher animals, is sometimes borne by the innocent cause of dispute; for a female seal on coming ashore may be pounced upon by two huge "seacutchers," each taking hold of her with their long tusks, and pulling in opposite directions with tremendous force, until they both forfeit the fruits of victory by the death of the poor victim.

When all the seals have come, the "seacutchers" that have held "possession" of the beaches, have succeeded in capturing from three to ninety females each, of which they take the most jealous care from the time of parturition—which occurs in two or three weeks after their landing—until they prepare to take their departure at about the first of October. During this long space of time—more than four months—though the young male seals frequently revisit the water in warm weather several times during the day, the "seacutchers" and females never do, but remain on the beach in the same place that they first took up their abode. Bright sunshine troubles them, and creates great restlessness among them; so much so that if it were to continue for more than three days, it would necessitate their going into the water, thereby disarranging the family groupings and causing the death of a great portion of the young from desertion and consequent starvation. But by a wise ordinance of Providence for the good health of the seals, but hardly for that of the human beings on the islands, this never occurs; in fact, the duration of the sun's undisputed reign is rarely over six hours in length, while a week will often pass in which he is but "seen through a fog darkly." The power of these animals, not only to exist, but to support their young, without any visible nourishment, is wonderful; they have often been cut open, and nothing found in their stomachs but a few small stones. They lose greatly in weight, however, for when they come in the spring they are replete with fatness; but by the time their young are large enough to go into the water, they are weak and emaciated in the extreme.

The fur seal is an entirely different animal from the common hair seal that is frequently met with in our harbor, not only in regard to generical classification, but also in relative worth; the skin of the former being very valuable, while that of the latter is comparatively worthless.

As the male fur seals grow old, their size increases with such regularity, that one accustomed to see them, can readily tell their ages at sight. When first born they are a foot in length, and covered with fine black hair; they are then entirely useless for commercial purposes; but the next year, the hair changes to a dark gray, and underneath it is a fine yellow fur, which, after being prepared, becomes the "Fur Seal," as generally known; their size has also increased, and seals one year old weigh over one hundred pounds, and are about three feet long. From this time their growth is very rapid; so that a *szacutcher* of fifteen years of age is often more than eight feet in length, and in weight over two thousand pounds. The females, however, never attain the size of the males, their growth ceasing at the third year.

In order to more fully describe the manner in which these animals are killed, I will give an account of one of the many "drives" in which I participated during a six months' residence on the Island of St. George.

At two A. M. I was awakened by the "Nirachic" (the native foreman) coming into my room; he came to tell me, that two men had just arrived from the "Starrie Artiel," a beach three miles from the village, with reports that great numbers of young seal had come ashore, were very well spread over the hill-side, and that the wind was blowing in from the sea, so that there would be no danger of their scenting our approach. On getting up, and finding that the weather was damp enough for our purpose, I gave orders to wake the people of the village, and prepare for a drive. In ten minutes, the driving party, consisting of twenty men, were assembled near my house, armed with long, heavy clubs, which are the only weapons needed in ercounters of this kind.

It was a northern summer sunrise; but a rising gale swept in fitful gusts great banks of thick, wet fog over the island. For a few minutes it would be clear, so that points at a mile's distance could easily be seen; and then again, rushing over, mingled with the wail of the wind, the fog covered everything, in a cloud so dense as to render objects only a few feet removed wholly invisible. We started in Indian file, with the "Nirachic" leading, at a half run, along a narrow rocky path, over the cliffs to the seal beach; now skirting their edges, so that we could hear, hundreds of feet below, the wild dash of the waves against their base; and now plunging into deep, narrow valleys, which, retaining the mist, were almost wholly obscured in darkness. The natives leaped from one wet and slippery rock to another, with the agility and certainty of a chamois among the Alpine hights; the fear of slipping being entirely obviated by the use of leather made from the flippers of the Sea Lion, for the soles of their boots—this leather possessing an adhesive power almost equal to that of a fly's foot. A half-hour's run brought us to the hills overlooking the beach. It was wholly obscured from sight, but up from the abyss rose the moaning and bellowing of thousands upon thousands of seals; the wild surroundings made it seem like the cry of lost souls in Pandemonium. The "Nirachic," followed by his men, crept softly to that point where the low, wide beach began to slope up into the hills; then suddenly, starting up with a shout, and waving their clubs in the air, they ran, following each other at a hundred or more feet apart, along the line made by the base of the hills; the seals, scattering in all directions, were either driven down on to the beach, or up the hill-side, between which and the beach a cordon of men was soon formed. The line of men then began to advance up the hill-side; the poor seals leaping or rolling along, but still making their way with considerable rapidity, were urged farther and farther from their refuge, the water. When they had been driven about a quarter of a mile, this huge drove, which must have contained over six thousand, was divided into ten smaller ones; two men were assigned to each of these, with orders to drive in different directions to the village. The reasons for this were, that in order to drive seals any considerable time, or distance, the earth has to be very damp; and, as they absorb much of the moisture out of the ground over which they pass, in a very large drove, those in the rear would have to go on dry ground; but, by being so separated, they all have nearly an equal chance.

Having been fully started, these droves were easily managed. The seals were allowed to rest after every two hundred feet of distance made; they never moved except when urged by means of shouts, and waving of clubs, and then in exactly an opposite direction from their drivers. It took about three hours to bring them to the settlement, so that it was six o'clock when they arrived there; and all the inhabitants of the village came out to meet them; partly to estimate from the number of seals what their individual gains were to be, and partly also to relieve the drivers, and allow them to get breakfast, before the killing commenced.

The spot chosen for the killing was a little valley, near the storehouse. Here the various droves were united, and the drivers, having refreshed themselves, by breakfasting on some of the young ones that they had killed at the beach and brought in on their backs, now prepared for action. Some two hundred seals were divided from the main body; and having completely surrounded them, the men contracted the circle, driving the seals as they did so into the center.

Then began the work of destruction. The seals were heaped one on the other, in their eagerness to escape from the death that threatened them on all sides; while the men struck at their heads with long clubs, and at almost every blow a seal would leap into the air, with a painful moan, fall to the ground, convulsed in agony, and quickly die.

So much actual strength had they, however, that sometimes a seal would seize one of the clubs with his teeth, and wrenching it from the hands of the man who held it, toss it, by a turn of his head, more than thirty feet. In a few minutes, all those under three years of age were killed, and those over that age driven off to find their way to the water as best they might. All the men, women, and children then came; and each, taking a seal, worked with such rapidity, that soon the skins had all been taken from those that had been killed. In this way another and another portion were taken from the great main body, until in the evening it was all exhausted, and the ground for over two acres was covered with bare white bodies, which, in the dim, stormy twilight, reminded one of a field of battle after a day's combat.

The skins were brought to the storehouse, counted, and each head of a family accredited with the amount that he and his household had taken. The next morning the skins were salted, and having remained in pickle five days, were taken out, rolled in bundles of two each, and were then ready for shipment.

The ground being so rocky, it was impossible to bury the seals' bodies, and to throw them into the sea would cause all the living seals to forever abandon the island; so they were allowed to remain, the natives only taking off enough of fat to supply them with oil, for food and light. At the end of the season, there were many acres of putrefied carcasses, which "reeking up to heaven," brought dire vengeance upon their destroyers, as the list of mortality all too clearly showed. Yet if the seals cause the death of the Aleuts, they are also absolutely necessary for their subsistence, as the islands produce no vegetables whatever; and the inhabitants are obliged to depend entirely on what is brought there for trading purposes. For meat, they use the seal, fresh in summer, salted in winter; varied perhaps, now and then, by a gull or loon; but the means of supplying themselves with the latter are so very inconstant, that were the former frightened away by any mismanagement—which has frequently been the case at other localities—the Aleuts would be also obliged to desert the islands, leaving them as barren and isolated as they were fifty years ago, when the Russian first brought men to reside there.

The number of seals killed on these two islands has averaged, for the ten years preceding 1868, a little less than one hundred thousand annually; and with proper management, this could probably be continued indefinitely, as the yearly increase far exceeds that amount. During the summer of 1868, or the first year that the country came under American rule, there were over two hundred and sixty thousand killed. Last year, although there was an act of Congress forbidding any one even to land on the islands, except by permission from Government, there were nevertheless, more than thirty thousand seals destroyed; the law being enforced and evaded in a manner that is peculiar to America, and which calls loudly for a Civil Service reform.

There are several bills now before Congress, each advocating a separate theory, but all uniting in the wish to preserve the fisheries. The one most feasible, and which will probably be adopted, is that of leasing out both islands, for a term of years, to responsible parties; allowing them to kill a certain number annually; obliging them to take paternal care of the

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Aleutian inhabitants; and holding them accountable for any infringement of its provisions. In this way, the Government may derive a revenue, varying from one hundred thousand to three hundred thousand dollars annually.

The great market for these skins is London, to which place they are all shipped, via San Francisco, or the Hawaiian Islands; the price varying, according to demand, from fifteen to twenty-eight shillings each. In order to reduce them to the state in which they are usually seen, they have to undergo a long process of cleaning, cutting, and dyeing, which is to American furriers — if their claim that it was formerly done here be a true one — a "lost art;" for certain it is that nowhere outside of England is it understood; and even there it is held as a monopoly by a half-dozen business houses. The skill required to remove the long hair that covers the fur, is only obtained after years of practice, the operation being an extremely delicate one. The skins are placed on frames, and the inner surface pared off, until the roots of the hair are completely severed; while the roots of the fur remain untouched, on account of their nearness to the outside surface. The hair is then very easily removed, and the light yellow fur made ready for dyeing, either to a more golden yellow, a dark purple, or black; and is afterwards brought to the general fur market.

[For the Scientific American.]

DEFORMED FEET AND SHOES.

BY DUFF CHILD, M.D.

Were any person to assert that at the present day our enlightened people are addicted to producing a deformed condition of the feet in both sexes to a more culpable extent than are the Chinese in the feet of their women alone, the declaration would no doubt be pronounced utterly untrue; yet the averment is certainly susceptible of proof, as the writer hopes to be able to show clearly.

Chinamen of the wealthier classes, it is well known, bring the feet of females to a size and form to correspond with their ideas of beauty by confining these members in an unyielding shoe, the dimensions of which are not allowed to be increased from early childhood to adult age. Our people, although they increase the size of the shoes worn, as their children advance in years, shape the foot covering after a form very far differing from the natural outline of the human foot, and thus drive it from its proper form, entailing suffering and deformity upon the mature years of their offspring. If what has just been written can be proved to be true, then my proposition at starting is correct—the Chinaman is less culpable for his efforts to render his child more beautiful, in his eyes, than we are, who deform our children's feet through ignorance, thoughtlessness, or neglect.

To begin the proof of assertions made, some description of the malformations which exist in the feet of our people may be given. Every adult in our country has noticed in others, or been painfully conscious in his or her own person that a troublesome and ugly protrusion or knob has appeared at the joint where the great toe joins the body of the foot, when the age of twenty-five has been attained, and frequently at a much earlier period in life. It is, furthermore, equally apparent that with persons of mature age the little toe has become a dwarf—is a mere rudimentary appendage of the foot—while the remaining toes are crooked, and thickly studded with the callosities called corns. Particularly, though, at the main joint of the great toe is the acquired deformity plainest to be seen. This joint is invariably found in a condition called *hypertrophied* by medical men, and is, very commonly the seat of a painful and troublesome affection, the bunion.

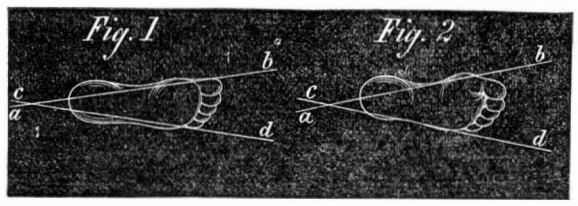
The writer assumes—and slight examination will show his assumption to be warrantable—that the natural form of the human foot is met with, in white people of the United States, only in children whose feet have not been much accustomed to the restraint of shoes; and the departure from this normal state is rendered strikingly evident when the foot of an adult is placed side by side with the feet of such children. Probably in no grown up white person in our country could an example of this normal foot be found; but in Indians, where little or no restraint has been applied to the member in wearing the soft moccasin or deer skin covering, the same typical outline that prevails in the undeformed feet of young white children is seen. A good illustration of the truth of this statement is to be met with in the remains of the tribe of Choctaw Indians living in the forests and around the towns and cities of Southern Alabama and Mississippi, who still adhere, for the most part, to their national style of foot covering.

Two figures are given in order to furnish the reader with a clear idea of the difference between the form of feet invariably seen in white adults, and what that form ought to be, as we find it exemplified in the feet of Indians, and of children of two or three years of age. The first cut represents what is claimed to be the proper normal shape of the human pedestal, the second plainly shows the commonly seen departure from that form. By the foregoing figures it is hoped that the remarkable and unwarrantable difference between the form of feet of children and adults has been clearly demonstated.

We next come to showing the cause of deformity which exists, and whether or not the change in the feet of adults would take place naturally through use and progressive development, even though the restraint of shoes had not been applied from childhood; and the question naturally suggests itself—Is this malformation due to a faulty fashioning of the shoes commonly worn by our people? Now, the fact that with grown up, and even aged Indians, who have not adopted the customs of the white race, as well as with children, no deformities, such as have been described, are to be found, ought to be conclusive evidence that the peculiarities in the feet of our men and women are not from natural causes. T the wearing of shoes should the great deformity met with in the feet of the entire American people be attributed, and not merely to the wearing of too tight or too unyielding shoes, but to their being wrongly shaped—too pointed—is the trouble or ugliness due.

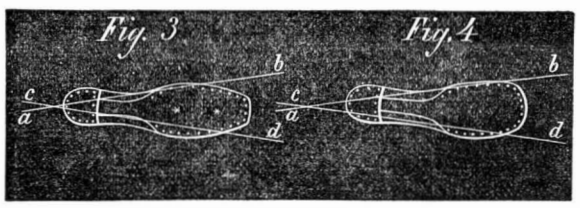
An attempt will now be made to show that the fault in the shape of all shoes manufactured in this country lies in the toe extremity alone. By comparing the two figures given below it will readily be seen how different a relation the lines, *a b* and *d c*, have to the points of the great and little toe in the respective cuts. Further, it will be seen that, in Fig. 1, the straight line, *a b*, passes through a point near the middle of the heel, over the internal margin of the joint where the great toe joins the body of the foot, and touches the inner side of the great toe for its entire length. Now, this line, *a b*, can be drawn through the same points on the sole of any undeformed foot; but the same will not be the result if an effort be made to describe it upon the sole of the foot of any adult white, or upon the sole of any shoe made after the style worn at the present day. The same remarks will apply to the second line, *c d*, in Fig. 1. This demonstation will serve to show that the soles of shoes, and consequently the upper leathers, are not fashioned in accordance with the natural outline of that portion of the body they are designed to cover—that they are too much drawn in or curved to a point where the toes must rest, particularly on the inner margin; they, therefore, must necessarily produce the deformities, which have been mentioned—must cramp the toes, give rise to disease in those members, and to a lack of freedom or ease in walking.

That these facts may be made more evident, a representation of the sole of what the shoemaker would probably term, a well shaped and roomy shoe, as shown in Fig. 3.



It will be seen that the lines, *a b* and *c d*, miss the points where the ends of the great and the little toes rest; therefore, in the wearing of such a shaped shoe it is quite plain that these two toes must be forced towards each other—must crowd the intervening toes and allow no room for their spreading apart, as they have a natural tendency to do, when extended or bent backward, as they are at the completion of each step.

A shoe, such as will allow sufficient room and proper freedom of motion to the foot, and will not give rise to deformity, must, it is contended, be shaped on the bottom, its most important part, like that in Fig. 4, which represents the shoe



for the left foot; furthermore, the upper leather must not, in making the shoe, be drawn so tightly across the toe of a thin last, as is the usual custom.

It is hoped that those who read this article will be convinced that the manner in which shoes are fashioned is a matter of importance not only to themselves and their children, but to the public at large. The writer has no private end in view in calling attention to the subject. His object is attained if he has placed the evils resulting from the wearing of carelessly and improperly shaped shoes in such a light as to attract attention; thus insuring the discontinuance of a barbarous custom now in vogue amongst our people. The subject is of importance, not only in relation to our health and the comfort in which we can discharge daily duties requiring constant use of our lower limbs, but it affects also the sale of shoes manufactured for traders in this class of clothing. The opportunity for selling thousands of pairs of boots and shoes is lost annually through a want of attention on the part of manufacturers to some points mentioned in this article. A large amount of the shoes now manufactured will fit, or can be worn by no one past the age of thirty years, no matter how careless he or she may be of appearances or comfort.

The subject has, in one sense, even a political bearing which has been recognized to a certain extent by our Government and those of other countries. To illustrate what is meant by the last remark, the writer will state that during the late civil war he saw a large portion of an entire brigade of soldiers rendered unable to keep up with their command on a rapid march, owing to their feet having been bruised and excoriated by their attempting to wear some very pointed shoes of English manufacture, which had been issued to the troops a few days previous to the beginning of the march. These sufferers, however, missed, through this accident, participation in a fearful battle which was impending, and their absence, no doubt, greatly influenced the result of that conflict. So the matter of ill fitting shoes concerns not only the private citizen and tradesman, but the warrior and statesman likewise.

Vignetting Glass.

A very easy way of making vignetting glasses photographically, and better, we think, than that suggested by Mr. Henderson, is, to place at a window a piece of dark paper of any suitable size, with an oval, pear-shaped, or other outlined hole in it. In front of that, and at a distance, to give a proper shading of light, hang, or secure in any convenient way, a piece of white tissue paper. Now set up your camera, and take a picture of this shaded light spot. To secure very great softness of shading, the tissue paper may be moved backward and forward between the lens and the hole in the paper. You will thus obtain a negative from which you can make any number of vignetting glasses. These could probably be printed so as to be most efficient on dry plates.—*Anthony's Photographic Bulletin.*

[For the Scientific American.]

COMPARISON OF THE REFRIGERATIVE EFFECTS OF THE CARRE APPARATUS AND COMMON ICE.

By referring to the following tables, the immense economy realized in producing cold "dry" air by artificial refrigeration, over low, "humid" temperatures, obtained by the melting of ice, is most forcibly illustrated.

A No. 3 "Carré apparatus," the producing capacity of which is 5 lbs. of ice per minute, constructed by Messrs. I. P. Morris & Co., at the Port Richmond Iron Works, Philadelphia, yielded the following wonderful results, a short time ago, in presence of Professors Morton, Booth, Tilghman, and other scientific men, who had been invited to witness its operations.

The temperature of a closed room, measuring 3,375 cubic feet was raised to 80° Fahrenheit by means of a stationary steam heater placed in it. A blower commenced to force cold air into this room from the refrigerating apparatus

TIME.				
At 1·20	when the thermometer stood at	80°	Fahrenheit.	
" 1·21	"	"	70°	"
" 1·22	"	"	66°	"
" 1·23	"	"	58°	"
" 1·24	"	"	53°	"
" 1·25	"	"	50½°	"
" 1·26	"	"	48°	"
" 1·27	"	"	46°	"
" 1·28	"	"	45°	"
" 1·29	"	"	44°	"
" 1·30	"	"	43°	"
" 1·31	"	"	42°	"
" 1·32	"	"	41°	"
" 1·33	"	"	40°	"
" 1·35	"	"	39°	"
" 1·37	"	"	38°	"
" 1·40	"	"	37°	"
" 1·44	"	"	36°	"
" 1·47	"	"	35°	"
" 1·56	"	"	34°	"
" 2·05	"	"	32°	"

During the trial, two glasses, one containing cold, and the other hot water, were placed at the opening of the inlet which conveyed the cold air into the room; the content of the first was frozen to three eighths of an inch thick in 12 minutes, while it required but 23 minutes to effect the same result with the latter, which had originally been at 140° Fahrenheit.

At the close of the operation, the thermometers of the cooling box indicated fully as low temperatures as at the commencement, proving conclusively that the apparatus could indefinitely produce the same results. It is worthy of note, that the steam heater was likewise cooled down to the temperature of the room.

The total amount of steam employed to supply heat, motive power, and water for the operation, was equivalent to less than 5-horse power.

On the following day the same room was heated to 80° Fahrenheit, and the temperature then lowered to 46° Fahrenheit by melting Portland ice.

The results obtained were as follows:

TIME.							Fah.
At 2·34	when	1,054	lbs.	of ice	were on the scales	the temperature was	80°
" 2·36	"	1,045	"	"	"	"	78°
" 2·38	"	1,038	"	"	"	"	70°
" 2·39	"	1,029	"	"	"	"	67°
" 2·43	"	1,024	"	"	"	"	63°
" 2·46	"	1,018	"	"	"	"	59°
" 2·51	"	1,012	"	"	"	"	56°
" 2·58	"	960	"	"	"	"	52°
" 3·05	"	948	"	"	"	"	49°
" 3·15	"	935	"	"	"	"	48°
" 3·22	"	920	"	"	"	"	48°
" 3·25	"	907	"	"	"	"	47½°
" 3·30	"	900	"	"	"	"	47°
" 3·46	"	880	"	"	"	"	46½°
" 3·56	"	868	"	"	"	"	46½°
" 4·32	"	815	"	"	"	"	46½°
" 4·58	"	760	"	"	"	"	46¼°
" 5·00	"	754	"	"	"	"	46°

At this last point, it would have required such an increased quantity of ice to lower the temperature that the experiment was abandoned.

This last trial shows a loss of 300 lbs. of natural ice to reduce the temperature of a room from 80° to 46° Fahrenheit in 2 hours and 26 minutes, which effect in the first trial had been obtained by Carre's apparatus in 7 minutes, with the same quantity of cold required to form 35 lbs. of ice; thereby showing that eight times as much ice were consumed to produce the same quantity of cold air as was supplied by the apparatus.

In both instances the room was placed under identical conditions for the comparative tests, the outside temperature having been perfectly excluded.

It is, therefore, evident that Carré's process, properly applied to industry, must entirely supersede the old system heretofore employed of melting ice, which only produces humid air, in such establishments as breweries, packing houses, oil, paraffine, salt and chemical works, and in other industries too numerous to mention.

From the above data, it may be safely calculated that *Carré's large and medium-sized apparatus can yield for from twenty cents to thirty cents the same quantity of "dry" cold air as is given out by melting one tun of natural ice.*

The Carré system being based on the chemical action of affinities does away with the intervention of immense exhausting and compressing gas pumps, which necessitate the aid of powerful steam engines and boilers. Moreover, the introduction of Carré's apparatus into industrial establishments, can in no manner vitiate the policies of insurance, the frigorific agent employed, *aqua ammonia* being a "fire extinguisher," they can be worked with as little pressure and as great safety as steam machinery.

M. J. BUJAC, Agent for Carré Ice Machines,
No. 17 Broad street, New York city.

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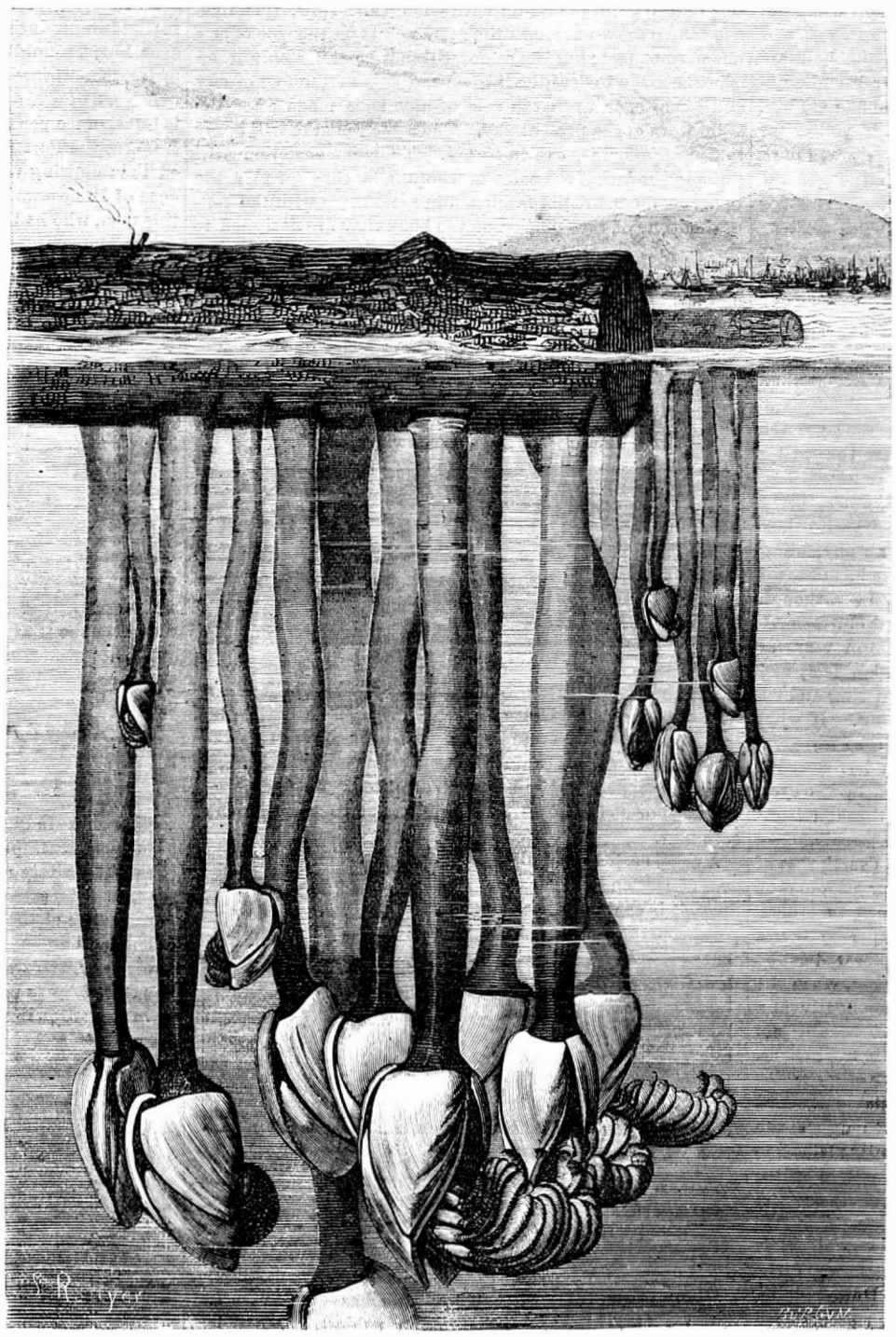
BARNACLES.

We give this week an engraving of a group of barnacles —a most accurate representation.

It requires a good deal of faith to believe that barnacles are related to crabs, for they are not the least alike, and the first is fixed like a shell-fish on to pieces of timber floating about in the sea, or to the rocks washed by the tide; while the last has legs, claws, eyes, and the power of moving and swimming. Yet it is quite true that the barnacle belongs to the same class of animals that includes the crabs, shrimps, and lobsters. If a piece of rock is put into a large glass full of sea water, many things may be seen on it which are of a white color, and whose shape is something like that of a thimble with the top battered in. If they are examined it becomes evident that the conical outside is formed of several little bits of hard shell joined together very carefully, and that the top has a valve in it. When the water is quite clear and quiet, a small flapper is forked out through the valve, and is moved to and fro with a motion like that of opening and shutting the fingers. The flapper has some long bristles attached to it, and they are beautiful, feathery-looking things, when examined under a microscope. The movement goes on for hours, and ceases upon the least alarm. Then the flappers are withdrawn, the valve closes, and the barnacle—for such is the creature—looks again like a conical piece of stone. The flappers are the lungs as well as the hands of the barnacle, and minute living creatures are entangled by them and passed by a current of water into the mouth which is within the shell. When the barnacle produces its eggs, it ejects them with a stream of water, and they float about in the sea, being very minute things. They soon become hatched, and then it is that the reason becomes clear why barnacles and crabs are placed by zoologists in the same class. The young barnacle is just like a shrimp, with a long body, many long legs close to its head, and a large tail; it has eyes, and swims about most vigorously. It appears to be constantly in movement, and although actively employed in swimming and in crawling, it does not care to seek for food. After a while the young free-swimming creature rests upon a piece of rock, or wood, or even on the back of a fish, and then a wonderful alteration takes place. The long legs and feelers near the head grasp the substance on which the creature is to live for the future, and a gummy substance comes from a gland which has been growing for some time close to the head. The gum sticks the legs and the feelers to the substance, the eyes diminish in size and are no longer seen, the tail and the hind legs grow into the feathery flappers already noticed, and the shell of many pieces incloses all. The barnacle is then fixed for life, head downward, and it loses its organs of sight, and receives a mouth and stomach, which it had not before, when in the free-swimming state. All barnacles do not undergo this change, for the males of some kinds live inside the conical house which holds the female, and never have houses of their own, for they remain in the free-swimming state. All the animals of the crab class have to undergo a change of form before arriving at maturity, and the common shore crab, when it is first hatched, is a long thing with a great head, and legs fitted for swimming, and not for crawling. As it grows the body shortens by curling the tail end underneath, and the legs and claws grow out of the swimming apparatus. Some of the barnacles that live on coral reefs are very beautiful, and their shells are ornamented in imitation of the flower-like polypes of the stony madrepores.

The accompanying illustration will give the reader a good idea of the appearance which a family of barnacles presents, clinging to the under surface of a floating log.



FORMATION OF BARNACLES.

The Australian Gum Tree in America.

A plantation of the Australian gum tree, Eucalyptus, is growing finely in Castro valley, Alameda county, California, It covers fifty acres of ground; the trees are planted in rows eight feet apart each way, making a forest grove of 39,000 trees set this season with one-year old seedlings of the blue gum and iron bark, the most vigorous and tall-growing varieties of the Eucalyptus.

The largest of these trees are but five years old, erect, straight, vigorous growth, and fifty feet high. They are elegant ornamental trees, somewhat resembling the laurel, but more majestic and massive in figure and foliage. They are hardy throughout the lower hill and valley country of California, and are the most popular street-shade and ornamental trees cultivated there.

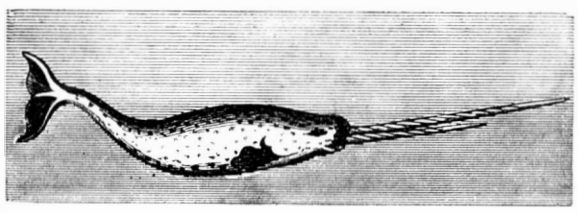
The wood of the Eucalyptus is hard, and the timber useful for many purposes. Their peculiar flavor and fragrance being disagreeable to animals, keep them from being eaten or gnawed. Hence the gum trees can safely be set where other sorts of trees would be destroyed. The past winter has been severely frosty, but not one of the tender little trees in this grove has been killed.

A great variety of Australian shade trees of exquisite foliage have been cultivated in California with entire success. They are very hardy, and might be safely introduced in Central Park.

THE NARWHAL OR SEA UNICORN.

Mr. William Bradford, the well-known artist of arctic scenery, on his return from his last voyage, brought with him several horns of the narwhal. Upon a recent visit to his studio in Tenth street, this city, we were shown several specimens, and we herewith give an engraving of one of these curious creatures.

The narwhal, or sea unicorn, an inhabitant of the arctic seas, is a huge cetacea, bold and active, armed with a powerful and terrible instrument of attack. It grows to a length of from twenty to thirty feet, and has projecting from its snout a sort of great halberd, a long sword of ivory, spirally drawn to a point. This enormous tusk springs from a socket in the maxillary bone of the upper jaw, and measures often six feet from the end of the snout. This weapon used formerly to be called the unicorn's horn. There are two preserved in the Museum of the Faculty, in Paris—the larger is six or



seven feet long, and at the base measures twenty inches in circumference. These tusks were formerly part of the treasure in the Abbey of St. Dennis. With what object these unicorns horns were preserved by the abbots we are not informed.

The corresponding tusk in the lower jaw is never so much developed and frequently remains hidden in the jaw.

The narwhal is of grayish white color with white spots, which seem to penetrate the skin. In the stomach of one the arm of a cuttle fish was discovered and also pieces of flounder. Scoresby relates that during his voyage to Greenland he met with great numbers of these animals, which swam near the vessel in troops of fifteen or twenty. Most of them were males, they seemed very lively, and often lifted their weapons above the water as if "presenting arms." They produced a most extraordinary noise, resembling the gurgling of water in the throat.

Most of the troop followed the ship, and seemed led by curiosity. The water being transparent, they could be seen dipping down as low as the ship's keel and playing with the rudder.

The Rule of the Road.

As the sinking of the United States corvette *Oneida*, by the Peninsular and Oriental steamship *Bombay*, has reopened the vexed question about "The Rule of the Road," which means how to handle ships when a collision is imminent, it may be interesting, says the *Shipping and Commercial List*, to know the import of the lawful regulations which govern in such cases. By consulting the "Regulations for the Government of the United States Navy," issued under the authority of the Secretary of the Navy in 1865, we find this rule laid down in Article I. of Section 2:—"In the following rules, every steamship which is under sail, and not under steam, is to be considered a sailing ship; and every steamship which is under steam, whether under sail or not, is to be considered a ship under steam." And Article 13, "If two ships under steam are meeting end on, or nearly end on, so as to involve risk of collision, the helms of both shall be put to port, so that each may pass on the port side of the other." The next section reads: "If two ships under steam are crossing so as to involve risk of collision, the ship which has the other on her own starboard side shall keep out of the way of the other." According to the testimony elicited on the trial of Captain Eyre, at Yokohoma, these last two rules cover the case of the *Bombay* and *Oneida*, and it would seem that they were obeyed by the British ship and not by the American; although that is no excuse for the criminal desertion by the captain of the former of the drowning officers and crew of the latter. The same rules are recognized in the English, French, German, and probably other marines; but it would seem that they are not always infallible. Thus, a correspondent of the London *Shipping Gazette*, who has spent a long life at sea, says experience shows that the adoption of the imperative rule of port helm for the safety of ships meeting in opposite courses is only a "theoretical problem," and "too often fraught with great danger;" that, "as the direction of the wind and sea acting upon the hulls, canvas and spars, differs so widely, and can rarely, if ever, affect both ships alike, and as the rudder power so much depends upon these ever-varying circumstances, it is not possible for any such arbitrary rules to apply with more than problematical success." The writer maintains that "ships too often deviate from their courses, under the pressure of law, to court collision, when ordinary intelligence would have avoided it." He says, furthermore, that he "is prepared to show how two ships of different caliber, and in various positions of each other, one under low canvas and making slow way, the other going eight or ten knots, and, by both porting, collision shall ensue." If this be true, it would seem that a modification or revision of the Rule of the Road is an imperative necessity. While ingenuity has been almost exhausted in devising means for saving life when cast upon the waves, no reliable mothod has yet been devised to prevent the disastrous results of collisions of vessels sailing or steaming in opposite directions.

AN OLD ENGLISH PATENT.—It is said that the following is the first patent ever granted in England, for the preservation of food:—"A. D. 1691, Oct. 7, No. 278. Porter Thomas, and White John.—A grant unto them of the sole use, exercise, and benefit of their new invencon of keeping and preserving by liquors *or otherwise* all sorts of flesh, fowle, and fish, and many other things, either in pieces or in whole bodyes, at a cheaper rate, for many years in all clymates, without changing the nature, quality, taste, smell, or color thereof, as good, palatable, and wholesome, to be eaten and made use of for any intent and purpose whatsoever, as when first killed or put into such liquor; to hold and enjoy the same for 14 years, according to the statute." Can any modern patent beat this?

WANTED, A DURABLE WASH FOR OUT-DOOR SURFACES.—Mr. R. B. Carter, of Burlington, N. J., suggests that a cheap and durable wash for fences and out-buildings would meet with a ready sale, and find great favor with the agricultural public. Will somebody solve this seemingly simple problem and put money in his pocket?

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SCIENTIFIC INTELLIGENCE.

RECOVERY OF SILVER FROM PHOTOGRAPHIC BATHS.

The *British Journal of Photography* recommends a very good method founded on the action of oxalic acid. Dissolve oxalic acid in water and render the solution alkaline by carbonate of soda; make the silver bath also alkaline in the same way and add to it oxalate of soda as long as any precipitate is formed; collect the oxalate of silver thus thrown down upon a filter, dry, and mix it with equal weight of bicarbonate of soda in a Hessian crucible, and expose to strong heat in a furnace. The reduction takes place easily, and the silver will be found as a brilliant regulus in breaking the crucible.

PHENYL PAPER.

This article would be useful for packing meat and other substances liable to decay. It can be prepared by fusing five parts stearic acid at a gentle heat, mixing well with two parts carbolic acid and five parts melted paraffine, and stirring until the whole has become solid, and applying the same manner as wax paper is made.

ACTION OF ARTIFICIAL LIGHT ON THE GROWTH OF PLANTS.

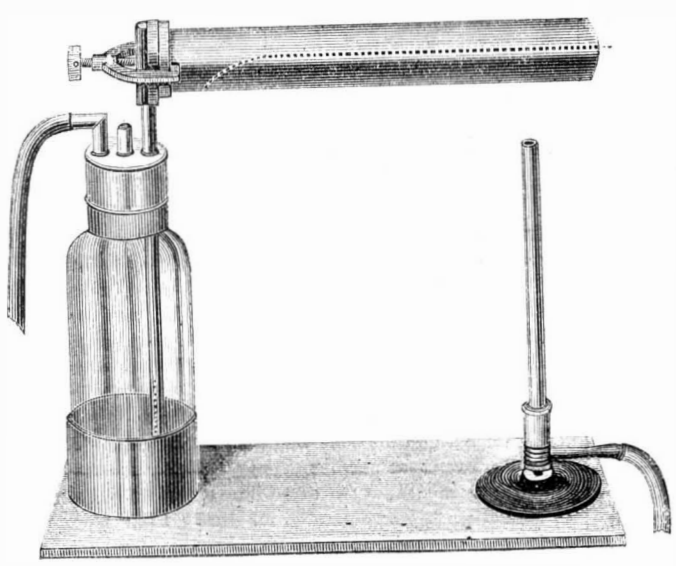
That plants would remain green in artificial light has long been known, but the action of this light upon the evolution of oxygen by plants has been less studied. Some experiments have recently been tried in France by exposing a plant immersed in water saturated with carbonic acid, to the direct sun light until eight or nine bubbles of oxygen gas were given off every minute. The vessel was thus brought into a dark room, and the plant was illuminated by the light produced by a magneto-electric machine; in the second instance seven or eight bubbles of oxygen also came off. The Drummond oxy-hydrogen light produced a similar effect.

TEST FOR COPPER AND IRON.

It is stated, in the *College Courant*, that an alcoholic tincture of logwood furnishes a test for copper and iron, of extraordinary delicacy; the hæmatoxylin combining with either metal, producing a pure blue color. By this test an appreciable result is obtained in water having only one per cent of iron or copper in twenty millions; and it will give an indication when galls or prussiate of potassa fail. When the water has been thus rendered blue, the coloring matter will precipitate in light flocks after several days, a deposit being thrown down when the water contains only one part of metal in five million parts of water.

OXYGEN GAS AS A REMEDY IN DISEASE.

Dr. Andrew H. Smith, of New York city, has recently published a pamphlet on this subject, from which we learn that oxygen gas is very largely employed in New York and elsewhere as a remedy for numerous diseases; and what adds very much to the value of the paper is that it contains the results of original investigations never before published. Dr. Smith first gives the history of previous researches, and then enters upon a description of the apparatus for the ready preparation and administration of oxygen. He prefers a mixture of chlorate of potash and black oxide of manganese for the evolution of the gas, as each ounce of the chlorate gives off 500 cubic inches of gas at a tolerably low heat. Dr. Smith has invented an ingenious portable apparatus to enable physicians or



nurses to prepare oxygen in the sick room in proportion as it is wanted. This consists, essentially, of a brass retort in the form of a cylinder, nine inches long and one and a quarter inches in diameter, resembling in shape a very large test tube. To the open extremity of this retort is fitted a cover of cast iron, held in place by a clamp which catches upon a projecting flange surrounding the mouth of the retort. This clamp is tightened by means of a screw. The accompanying diagram will give a better idea of the apparatus than any description.

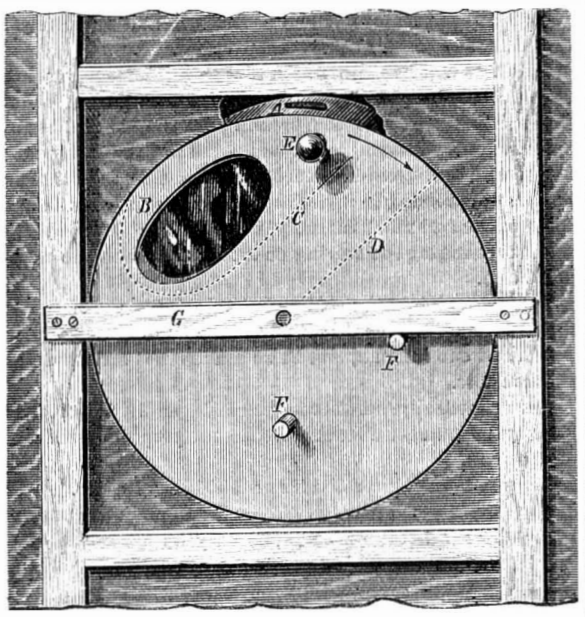
The retort is but half filled with the mixture of chlorate of potash and peroxide of manganese, and this quantity is distributed along its whole length to within an inch of the cover, thus leaving nearly one half of the diameter of the retort free for the passage of the gas. The heat of a Bunsen burner or of a powerful spirit lamp is employed, beginning first at the closed extremity of the retort, and moving it along as the material becomes exhausted. The wash-bottle is half filled with a solution of caustic potash.

An apparatus of this kind is not only adapted to use in the sick room, but, on a larger scale, would be better than a retort for making considerable quantities of oxygen. It would be less liable to explode, and the chlorate being exhausted from the further extremity, the liberation of the gas can be carried on gradually and under perfect control.

Dr. Smith details a large series of experiments, conducted to ascertain the physiological action of the gas. The subject belongs more particularly to medical journals, but we can give a recapitulation of the principal cases where benefit was derived from treatment with oxygen; Poisoning with charcoal gas and chloroform, dyspepsia, diabetes, headache, paralysis, consumption, asthma, chlorosis, cholera, and many other instances. The amount of oxygen that a patent can respire is a matter of astonishment, and its effect is to fatten, and to restore the bloom of health. There is a wide field for investigation in the use of oxygen, and Dr. Smith is entitled to great credit for the perseverance and skill he has displayed in prosecuting and publishing his researches. We trust that his example will be followed by others.

WORMOOD'S REVOLVING PAY BOX.

This is an apparatus for receiving the fares of passengers on street cars and omnibuses, in which the passengers themselves deposit their fares, in such a manner that the conductor can see whether the right fare is deposited or not; but cannot have access to the money or tickets deposited.



Such a device would compel honesty in the dealings of conductors with their employers, and if cheap and effective, and free from objections in practice, would be likely to be generally adopted by such corporations, as it is now known that large sums are constantly being lost through the peculations of the collectors of fares.

On refering to our engraving it will be seen that the general form of the box is that of a cylinder, and that it may be placed in any convenient position for the collection of fares, and the ready inspection of the same by the collector.

A is a small aperture through which the fares are put into the box. C is a curved shelf for receiving and temporarily holding the fare until inspected. This shelf is so arranged in the box as to prevent the escape of the fares into the space below except at one end, and the box must be turned on its axis one fourth around for the fare to slide on the shelf, D. When the box resumes its proper position the fare drops to the space below. B is a glass plate through which the collector can see what ticket or money has been deposited.

F F are stops on the box, which, striking the stop bar, G, arrest the movement of the box each way at the proper points. E is the knob for turning it.

It would seem that this is a convenient, simple, and efficient device for the purpose intended, and one likely to attract the attention of those interested in obtaining a check upon collectors of fares.

Patented, through the Scientific American Patent Agency, Feb. 8, 1870, by W. W. Wormood, of Dubuque, Iowa, who may be addressed for car and road rights.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Cheap Oxygen.

MESSRS. EDITORS:—The process of obtaining oxygen from minerals is comparatively expensive; and as a way of obtaining it cheap is desirable, many persons have endeavored to discover a way by which it might be extracted from the air, one of whom, in an article entitled "Absorption of Oxygen by Charcoal," in No. 12, current volume, has hinted at an idea of his own (?) for procuring it by means of the unequal absorption of gases by charcoal. But our philosophical friend has communicated his discovery to us too late, as it has been practiced for nearly a year by M. M. Montmagnon and Delaire.

The method of obtaining it is by exposing charcoal to the air, and then saturating it with water. 100 liters of charcoal will absorb 925 liters of oxygen, but only 705 liters of nitrogen. On saturating it with water all of the nitrogen escapes, save 55 liters; while 575 liters of oxygen remain. The residual gas is collected by means of an air pump.

The gas thus obtained is comparatively pure oxygen; but if it is desired to make it free from all nitrogen it may be subjected to the same operation again, until the whole of the nitrogen has escaped. Oxygen, in large quantities, is prepared in this way very cheap; all that is required is the apparatus. The charcoal may be used in subsequent treatments as it does not lose its virtue by the operation.

There are many other substances which absorb oxygen from the air; among which the most prominent are blood, phosphate and carbonate of sodium. These absorb about ten per cent more oxygen than nitrogen, and may be treated in the same way as charcoal.

Pittsburgh, Penn. CLARENCE H. DUPONT.

Organ-Blowing Machine Wanted.

MESSRS. EDITORS:—I wish, through your paper, to call the attention of inventors to a much-needed invention; namely, an apparatus for supplying wind to church organs so as to do away with the present inconvenient and vexatious mode of supplying wind, which is by manual power.

Machinery for this purpose has been invented and in few places is now in use, but the power used is objectionable. Fire is dangerous, inconvenient, and expensive; water is inconvenient and expensive: and as the force needed is very small, my thought is, that it may be provided in a clock movement of the lever kind, the power needed being less than one sixteenth horse-power; and as the working time of such machinery would not be required longer than from three to five hours, I think some such power may be provided as to meet every requirement.

I think some simple machine for this purpose "would pay" the inventor well, as the providing a "blower" is a constant annoyance to organists, of which there are some thousands in this country; besides which a really simple and efficacious adaptation of machinery for this purpose would be very valuable all over Europe.

Whoever thinks of this had better at once discard all thoughts of fire, water, or electricity, as the device must be cheap in its first cost (say, not more than about $200), and inexpensive in its working, as the salary of a blower does not average $80 per annum. W. H. FENNEY,

Organist of the Church of the Epiphany.

Philadelphia, Pa.

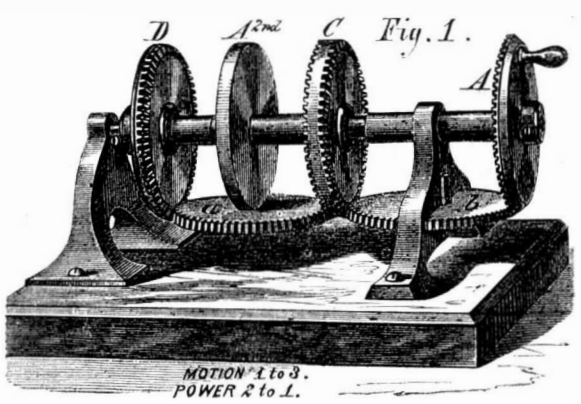
VERTICAL MULTIPLIER,

OR INCREASED MOTION OF WHEELS ON A SINGLE SHAFT, WITHOUT REGARD TO THE SIZE OF THE WHEELS, OR NUMBER OF THE COGS, AND WITHOUT THE USUAL LOSS OF LEVERAGE.

BY L. S. FITHIAN.

MESSRS. EDITORS:—I send you a perspective view of my machine in its simplest form, with diagrams illustrative of its operations. The machine was constructed to show the principle and fact, that the increased motion was not due to the size of the wheels, or the number of the cogs; each wheel in this model has seventy six cogs; when A is turned once, D will turn three times, which is caused as follows: A and A^{2d} are fast upon the shaft, and the motion is of course the same one to one up to the center of *a*. All the rest are loose upon their centers; consequently *a* has two distinct motions, viz., one bodily around the shaft, and one rotary upon its own center.

The bodily motion of *a* would carry D around once; then if C were held at rest, this would cause *a* to revolve on its center once, which would be communicated to D making twice; then if C were permitted to revolve once in the reverse by the action of *b*, *a* would make a second revolution upon its own center, which would be communicated to D, making three, viz.: one by the pin or bodily motion of *a*, one by the inertia of C, and one by the reverse of C, making three, which may be decreased or increased as desired, this being the unit of the machine and its simplest form.



The claims of this machine are plainly and simply stated. That there may be no mistake, it is fully admitted, that they strike at and deny all of what are now known as the "laws of motion in mechanics."

The objections are all of one character, viz: that motion in mechanics is a governing cause of the loss of power, quoting the most concise and condensed expression of the "law of motion," "What you gain in speed you lose in power. 1 to 3=⅓ 1 to 4=¼," etc.

It has been before many of the most acute minds. There have been many to confidently repeat the old historic words "can't," and "impossible;" but these are not arguments or proofs, and have in fact been buried so often in the history of science, that they have a clear right to rest in peace, without a resurrection by intelligent men.

Only a few have ventured upon a demonstration, and not one of these has been willing to stand by his demonstration when examined.

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For an objection as a last resource, the cry of perpetual motion has been raised by so many, that it might almost be said that this was the only real objection that could be brought against the claim of one half resultant power in this machine.

We propose to examine what there is in these objections.

It it admitted by all, that the only real valid objection to perpetual motion, is sharp and decisive, and may be stated in a single sentence, viz: "It is an effort to get an effect without a cause."

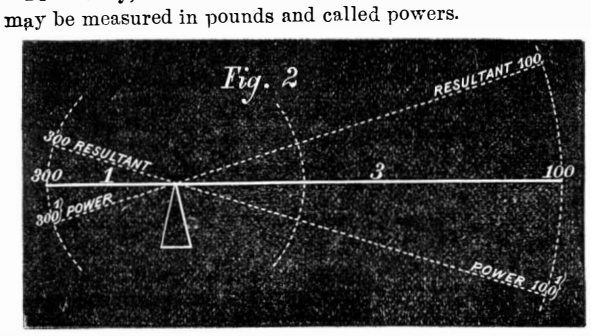
This being so, it follows, that the man must be *luny* or crazy, who makes levers or any mechanical device to get perpetual motion; they are all causes, and a cause is not needed. Then as every proposition must have its reverse which will be equally true with itself, what must be said of the person who starts the objection of perpetual motion when examining the claims of a machine that has levers and cause for all that it claims?

It would seem that an apology is needed for much that is written below. Each proposition is so simple in itself, as to be self-evident; and our only excuse is, that we find that terms and maxims that are in general use amongst men, which we supposed were used in the same way in which we use the terms "the sun rises," "the sun sets," not that we really mean that it rises or sets, but only appears to do so, are used as arguments, as though the very things were just as the language denotes. For instance, "What you gain in speed you lose in power," is an absolute truth or law with levers of the second order; but it has yet to be shown that it has the least standing room outside of, and away from uneven length levers, and still it is used as absolute law in any and every case. The "laws of motion" are quoted, as though there could be such a thing as law attached to a thing or condition which is always and in all cases a resultant or effect.

It has been said by some that even if motion is not a governing cause of the loss of power, it must be seen that motion is an absorbent of power.

This must be admitted by all, and as all altered speed or motion in mechanics is caused by levers or wheels, we propose to examine to what extent motion is an absorbent of power in mechanics.

Practically, force and resistance are the same thing, and may be measured in pounds and called powers.



Here is a lever, or wheels of one to three, and it will be plainly seen

First. That the 300 and the 100 are not the cause of motion; but on the contrary they are the cause of balance or rest.

Second. That any excess, however small, placed upon either end, is the cause of motion, and then that end becomes the power and the other the resultant.

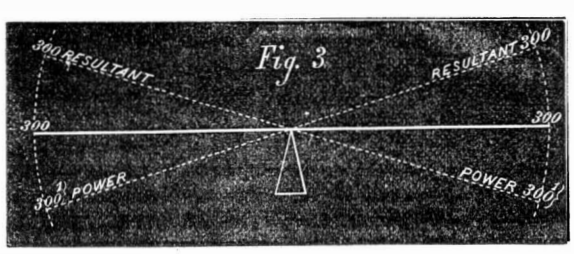
Third. That the excess remains upon the end upon which it is placed, and moves in the radius of that arm of the lever. For the purpose of illustration let us assume one, and place upon the short arm or 300.

Fourth. Then the 300 is carried by the one in the radius represented by 1, and the 100 is moved in a radius represented by 3

Fifth. That motion always commences with the excess, and ceases when it it removed.

Sixth. That motion is an absorbent of power to the extent of the excess and no more.

Seventh. That this would be equally true of levers of 1 to 4, 1 to 5, or any other number.



The same remarks are plainly true here. The 300 on each end of the lever are not the cause of motion, but are the cause of balance or rest; and any excess on either end makes them alternately the power and resultant.

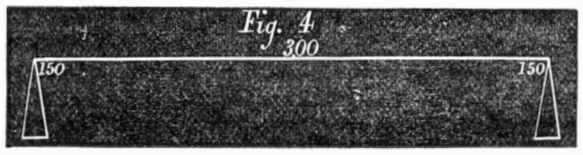
This is the plain intermediate of mechanics, and shows plainly that the mechanical maxim "that plain intermediates do not either increase or decrease power," is absolute law. Their simple function being to practically remove power from one point to another, and reverse motion, and may be used for either purpose alone, in which case the other is incidental and cannot be avoided.

An even length lever with a fixed stationary center or fulcrum, simply reversing motion, is always and in all cases a plain intermediate, and cannot in any way be made to gain or lose power.

But an even length lever can be, and is constantly used in a different manner, and to perform different functions: viz: a divisor or multiplier of power. It is given in the succeeding cut.

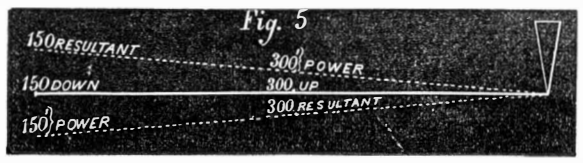
This is its most simple form. The power 300 is on the center, which it divides, and places one half upon each fulcrum or end, and it will be plain

First. That if the fulcrums be represented by hands upholding them with a power of 150 each, then it becomes an adder, and adds the two ends into the center. This is the best proved lever of all it being self-evident to the most



ignorant as well as to the most intelligent; and each knows with the most absolute certainty that he is lifting one half the power applied at the center.

Second. That if one of the fulcrums is left, and the hand applied to the other end, then with 150 down on the end and 300 upon the center, it is a divisor or multiplier of power by two, and is in balance thus:



And that the center and end become alternately power and resultant, as excess is placed upon either.

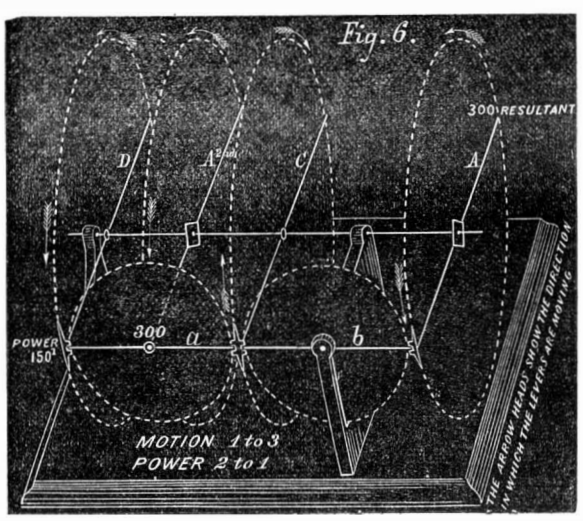
Third. It will be plainly seen that this difference exists between this lever and all the others, viz: That in the others, the balancing powers are pressing in the same direction, and when they become power and resultant, that they move in opposite or reverse directions; while in this, the balancing powers are pressing in opposite directions, and when they become power and resultant, they move in the same direction without changing the bearing on the fulcrum with the change of motion.

These are plainly the full and simple functions of the different levers when used in their simple form of two power points and one fulcrum, and there can be no variation from these results.

Then practically, an uneven length lever divides or multiplies by the number which represents the proportionate length of the arms.

An even length lever divides or multiplies by two.

The excess which gives motion is the same in all; and motion, whether great or small, is only an absorbent of the excess, no more and no less.



Above is a diagram of the "Vertical Multiplier;" the arrow heads show the direction in which the levers are moving And it will be plain

First. That the lever *b* is a plain intermediate with a fixed stationary center or fulcrum, simply permitting or reversing motion, which never is, or can be a gainer or loser of power.

Second. That the lever *a* is used with the power on the center up, and on the outer end down, and the other end on C is the fulcrum, which makes *a* a divisor or multiplier of two.

Third. That by the construction of this machine, no power can be applied to the center of *a*, but from the opposite side of the shaft or main fulcrum at A; and that none can be applied on the outer end of *a* but through D; and therefore when we call the center and outer end of *a* the balancing, and alternately, as any excess is placed upon either, the power and resultant points, it is equivalent to saying that D and A on opposite sides of the shaft are the balancing, and alternately, the power and resultant points of the machine.

Fourth. An examination of the bearings of the levers *a* and *b* on C, will plainly show that it is absolutely certain that no portion of the power applied to this machine ever reaches the fulcrum C through *b*, but only and alone through *a*; and that the amount applied through *a* when in balance, is always exactly one half the power applied on the center of *a* (or the opposite side of the shaft at A), and this one half (which is lost in the fulcrum or deadwood in other machines) by being applied to the movable fulcrum C, is the sole cause of the third revolution of D, and this must be a saving of that power lost, or a gain of one revolution in the three made.

Fifth. That balance and motion alone is controlled by and communicated through the lever *b*, and it has already been plainly shown that motion is not the result of the power applied, but of the excess alone which never leaves the lever upon which it is placed.

Sixth. That with 150 down on the outer end and 300 upon the center of *a*, the machine is in balance, and motion will commence with any excess upon either.

Seventh. That without the reverse of C, the motion of this machine would be one to two, and the power one half, the other half being lost in the stationary fulcrum C or dead wood. Then as C is reversed by this lost half and thereby a third revolution is gained, this is a clear saving of the half power lost, or a clear gain of one revolution by using that which is lost or thrown away in other machines.

Eighth. That if a machine is made with knife edged bearings, so as to do away with all friction, and does not balance with 300 and 150, then it is false or untrue in some particular. It cannot differ from its levers; these are its only causes; and we prove the truth and accuracy of balances with known tried weights.

This machine has been patented in the United States and in Europe by Messrs. Munn & Co. It has been put into practical use, and is now being applied to mowers and reapers. For further information apply to the owners,

Southmayd, & Co., 194 Broadway, N. Y.

Yield of Lead from the Missouri Mines.

Messrs. Editors:—Being a subscriber to the Scientific American, I beg leave to correct a statement in regard to the annual yield of lead by the Missouri mines, made on page 185 of your current volume, estimating it at *less* than 2,000,000 pounds per annum.

In 1819, Henry R. Schoolcraft visited this lead region, in the interest of the United States Government, then owning the mineral lands, and allowing them to be worked on payment of certain rents, to collect which cost far more than the amount collected. He estimated the annual yield at 3,000,000 pounds, and recommended a tariff duty of four cents per pound, on imported lead, to encourage mining and increase the production.

In 1855, Dr. Litton published in the first and only report made on the geology of Missouri, carefully collected statistics of the amount of lead made in the three counties of Franklin, St. Francois, and Washington, from 1841 to 1854, inclusive, showing the annual yield to have been 3,833,121 pounds per annum.

In 1854, Prof. J. D. Whitney, in his "Metallic Wealth of the United States," makes the following summary in regard to the Missouri lead mines: 'Formerly more extensively worked than at present; not now of much importance." And in regard to mine La Motte, he says the "Granite is everywhere near the surface," and therefore intimates that the mines there are about exhausted.

Now for facts: Mine La Motte is yielding, and has been yielding, for years, constantly and largely increasing amounts of ore, and interests in the property have lately sold at a very high figure, and new energy and capital are being applied to the development of mining there.

The total yield of the Missouri lead mines for the year 1869 fell but little, if any, short of 12,000,000 pounds. Returns from a portion only of the furnaces of this (Washington) county alone show a production of some 3,000,000 pounds for 1869. This furnace started in August, 1866, and its annual production for 1868-9 has averaged nearly 600,000 pounds per annum.

In the very article in which the annual yield is estimated at 2,000,000 pounds, the receipts of Missouri lead are stated at 172,538 *pigs*, which pigs will average 65 to 70 pounds each, making nearly 12,000,000 pounds.

Thinking it of some importance that so large an interest as the lead production of Missouri should not be undervalued by being under-estimated, I hope you will give the correction in your widely-read journal. N. W. Bliss.

Kingston Furnace, Mo.

Explanation Wanted.

Messrs. Editors:— I would like some one of your numerous correspondents to give some explanation of the following experiment, viz: It consists in four persons lifting another one, extended on the floor, to the hight of their heads, by using only the *fore finger* of each hand. It is accomplished in the following manner. The four range themselves two on each side of the one to be lifted, and each with his *fore fingers* joined longitudinally. The person on the floor folding his hands, *extended* on his body and his feet crossed. Then at a given word the four persons expel all the air from the lungs through the mouth, at the same time stooping simultaneously, with their fingers extended for lifting, then rising again they inhale as much air as possible; this is repeated until they stoop the third time, when with the air expelled from the lungs they place the fore fingers under the body of the person, that is at the shoulders and knees and with the very slightest effort, he can be raised as high as their hands will reach, the person on the floor must also expel and inhale, but contrary to the others, that is, when they inflate the lungs, he expels the air from his, so that when they lift, his lungs are inflated as highly as possible, while theirs are comparatively empty. The heaviest of men may be raised in this manner by very weak persons naturally. A small close room is better for this feat, as it prevents disturbance of the air which is fatal to the accomplishment of the experiment.

C. H. Ladomus.

Chester Pa.

The True Meaning of Inertia.

Messrs. Editors:—There has been lately some discussion in your columns in regard to the term—inertia. Many writers upon mechanism make a wrong use of it, as it seems to me, and thereby confuse the ideas of the reader. Thus they will define it to mean "deadness," "want of power," "that perfect indifference which matter has to the state it may be in, whether of rest or motion;" and declare it to be an *essential* property of matter. After giving this correct definition they

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will perhaps when speaking of motion, use such phrases as "overcoming the inertia of a body" when we apply force to it, or "the resistance offered by the inertia of a body."

Now the poverty of language may permit us to speak of "white black birds," and to say that "green black-berries are red," but we ought not to talk of *overcoming an essential property of matter.*

Would not a clearer view be given by presenting the subject something like this. Bodies may or may not have motion as a bucket or tank may or may not have water in it. In either case it is a matter of indifference, and as the tank offers no resistence to the reception of a few or of many drops of water, so a body will take without the least resistance a small or large amount of motion, and as a tank retains the liquid until something takes it away, so a body retains all the motion given it until it is transferred to some other body.

Then amplifying and illustrating the subject as far as necessary after this fashion, would not the learner get clear ideas of the whole subject of motion and force?

Terre Haute, Ind. R. S. BOSWORTH.

SCREW PILES.

It is a fact worthy of notice that although screw piles have been in use in England and the transatlantic continent for nearly forty years, they have scarcely been employed in France on any scale that warrants a description. This is the more difficult to understand since the value of the principle is universally recognized, and in many situations it would be impossible, in an engineering point of view, to obtain a foundation without them. It is, in fact, only since their introduction and the establishment of their advantages that certain structures, lighthouses for example, have been successfully erected on shifting sands, and other kinds of foundations, upon which, by the ordinary methods in use, no superstructure could have ever been erected. On the Bombay, Baroda, and Central India railway screw piles were employed as the means of obtaining a foundation in the numerous rivers crossed by that line. They were screwed down, sometimes by capstan power, at others by yoking native cattle to the end of a long lever, until they came to a firm substratum. Several of these properly braced together, formed the piers upon which the iron girders were placed, which were nearly all of a uniform span of sixty feet. Unquestionably one of the chief merits of the screw pile is its great suitability for rapid rivers, which sometimes during a severe drought are nearly dry, and which in flood time, roll down their waters with all the impetuosity of a mountain torrent. The screw pile not merely fastens itself firmly into the ground, but its comparatively small sectional area offers but little impediment to the motion of the stream. At the same time, it must not be forgotten that there are certain descriptions of substrata for which the screw pile is not adapted, and where it becomes necessary to seek a foundation by the employment of other means. We shall allude to this presently. The first application of the screw pile principle was made by the inventor, Mr. Alexander Mitchell, in the harbor of his native town, Belfast, where some buoys were successfully anchored in that manner. The light-houses at Fleetwood and the Maplin sands demonstrated a few years afterwards that the invention was likely to prove of great utility to engineers. The former of these was carried away bodily about a month ago by a schooner which ran into it. It was only the superstructure which fell, the piles remaining in their place. A large number of dock walls, jetties, breakwaters, and other engineering works have been erected solely upon foundations secured through the agency of these piles. A brief description of their advantages and suitability for the purposes of foundations will prove of interest to not only our professional readers, but to the amateurs as well.

A screw pile only differs from an ordinary one of timber, or cast or wrought iron, by being furnished at the lower extremity with a screw or spiral. The screw is of particular construction, as it is provided with only two or three turns, or more correctly blades, which are of different diameter. The upper of these has the greatest resistance to contend with, and is therefore of a larger diameter than the others, sometimes reaching the dimension of four feet. The pile being adjusted in either a vertical or inclined plane as required, a movement of rotation is imparted to the upper extremity, and the penetration commences. One of the chief merits in thus obtaining a foundation is that the pile does not dislodge the earth near and round about it, but bores its own way, so to speak, without disturbing the neighboring layers. Thus fixed in position, the pile can be used either as a mooring post, or as a portion of a pier upon which to erect a bridge, jetty, or other analogous superstructure. The screws are either cylindrical or conical, of cast or wrought iron, and the piles may be also of either material, or of timber. The employment of the latter in connection with the screw end is rare. According to the nature and consistency of the ground to be penetrated, so must the shape and size of the screw be proportioned. If the earth be of a loose, friable, easily penetrable character, a cylindrically formed screw will answer for the purpose; but if it be of a compact, tenacious description, it becomes necessary to use a screw in the shape of a cone. No screw, whatever may be its form and powers of boring, will penetrate into absolute rock; but the principle has been successfully applied in instances where the foundation was a bed of coral. It is manifest that the power required to get the pile down will depend altogether upon the nature of the ground to be penetrated As a rule, a capstan worked by manual labor is found sufficient. One of these machines with eight bars about twenty feet in length, each manned by five or six laborers, has been found capable of getting down a pile four feet in diameter, to a depth of fifteen feet in an hour and a half, in ground composed of sand, clay, and loose rock of a schistose nature. The conditions being the same, a period of two hours was sufficient to sink a screw pile to a depth of twenty-one feet. In cases where it is not possible to employ the leverage of capstan bars, that is where room cannot be obtained for erecting a platform, the head of the capstan is furnished with a wheel which can be worked by an endless rope or chain set in motion by a gang of men. Where the earth is very dry, screw piles can often be "got down" by very simple means. It sometimes suffices to fix to the upper end of the pile a rod with an eye in it to attach a short iron lever, and screw the pile down. This arrangement will only be available for short depths.

The especial advantages of screw piles are considered generally to have more relation to bridge foundations, than any other engineering works; but there is another very important application of the principle which we have as yet only touched upon. It relates to the anchorage of buoys, and mooring posts for vessels. Obviously the desideratum in this particular class of works is, that the hold or grip of the anchor should be a maximum. In other words, what kind of anchor will give the greatest resistance to a tensile strain, tending to cause it to drag, the anchor itself being of the least weight? It is a simple question of a combination of maximum hold with minimum weight. About twenty years ago some highly interesting and instructive experiments were undertaken with a view to the practical elucidation of this important point. Some of the best-made anchors, weighing two hundred weight, were dragged along the ground, by a force which produced no effect upon a screwed mooring, inserted to a depth of three feet, and weighing only eight pounds. Others weighing seventeen pounds resisted hauling better than anchors having a weight of nearly five hundred weight. The value of screw piles and moorings for lighthouse, jetties, breakwaters, and floating signals, and all structures exposed to violent hurricanes and sudden impactive forces, can scarcely be over-estimated. On this account they would be found very useful in stormy latitudes, for securely fixing telegraph posts, as it is the commonest occurrence in the world to hear of the telegraphic communication being interrupted in consequence of the posts being blown down. There is one more point relating to screw piles that deserves mention, although probably it is seldom brought into notice. It is the facility with which they can be "drawn." All that is necessary to accomplish this task, which with piles of a different description is a very tedious and laborious one, is to reverse the operation of getting them down—in a word, to unscrew them. It might be stated that when a pile is once down, it is not intended ever to come up again. This assertion is not quite correct, even for permanent works, and certainly incorrect when temporary works are considered. Piles are sometimes required to be drawn in situations when it has been thought that they were down "for good." In works of a temporary nature, where the piles are of timber, they are seldom permitted to be drawn, as the operation would disturb the foundations of the permanent structure, but are cut off near the ground level. If screw piles were employed in temporary dams and such like work, they might be drawn, as the unscrewing would scarcely affect the ground in any sense, and their comparatively small sectional area would still more lessen the chance of any danger. The piles might thus be used over and over again, and constitute a regular item of the contractor's plant. Perhaps the only description of ground that would be unsuitable to the use of these piles would be a stiff clay. The screw would get clogged and the labor of getting it down would be more than would compensate the other advantages. Hollow cylinders would be the proper substitute in such a case.—*Building News.*

What is Wanted in Modern Art.

If the Arts are to flourish among us, says John Ruskin in one of his Oxford lectures, we must recover for the mass of the nation three requisites which they at present want: 1. Wholesomeness of food. We must no longer allow them to eat and drink poison instead of food; everything provided for their daily sustenance must be good and pure as well as plentiful. 2. Wholesomeness and decency in dress. It must be such as becomes their rank — serviceable and good, and, at the same time, becoming and in good taste. 3. We must improve the lodgings. All ecclesiastical architecture is developed for civil and domestic building, and its highest achievement may be said to be a "glorified roof." Now, in this our modern architects are strangely at fault; they seem hardly to know what to do with a roof. Roofs ought never to be built of iron, but always of wood or stone. And we must remember that the little roofs must be built before the large ones. We must see that the poor have houses suited to them, built as strongly as possible, and daintily decorated.

All arts are founded on agriculture by the hand, and on the feeding, dressing, and lodging of the people. Christian art was only possible where kings and knights were compelled to care for their people, and it disappeared when kings became tyrants, devourers of the people. The health of art depends on its reference to industrial uses. It is from this use that it first arises. In order to eat and drink, we must have the cup and platter, and especially the cup. In order that we may use this cup conveniently, it must have a handle. To fill the cup, we must have a pitcher of some sort; this pitcher, if it is to be carried safely, must have two handles. Now in these same articles of use have been developed the most beautiful lines and types of severe composition that have ever been attained to in art.

We can not have any right architectural art, or morality, or happiness in cities such as now deface our country. They are not built, they are rather dotted and coagulated in shapeless, hideous blotches over the land which they consume. We must, if we would have art, have beautiful cities, not overgrown in size, encircled with gardens and shaded with trees; we must banish far from us all the manufactures which need the aid of huge furnaces of fire; or at least, we must reduce them to the smallest possible limit. At present England triumphs in her commerce; she is deaf with spinning-wheels, yet her children have not clothes to wear; she is black with fuel, yet they cry aloud for food; she has sold her soul for gold, yet they die of hunger.

Religious art cannot be used amiss if we remember that God inhabits cottages as well as churches, and that in the former as well as in the latter He ought to be well lodged. Put the Arts to universal use, and we shall find in them a universal inspiration and benediction; let everything be equally sacred, equally divine — Art will be divine wherever it is truly fair and serviceable. God has made everything beautiful in its kind.

Are Scraped Surfaces Indispensable?

In stating this question as broadly as we have done, we disclaim at the outset any intention of dispensing utterly with scraped surfaces, or of erasing from the vocabulary of mechanical technicalities this detail of the workshop. The doubt has arisen in our mind whether much of the time and elaboration expended on scraping iron surfaces might not, without injury to the work itself, be omitted. The value of a positively correct face on a valve seat or on the V-shaped ribs of a slide lathe or planer, is undoubtedly great when it is well done, but when poorly executed, the utility of it is, to say the least, questionable. We make the unqualified assertion that not one man in twenty is competent to finish a truly scraped surface. Scraping iron down to a perfect face is an art by itself, and comparatively little attention, so to speak, has been given to the subject in this country. The common method in use is to take an old file of any kind (except round or square), flatten its end out like a chisel, grind it up square on the stone, and then "grub" away on the iron wherever the workman sees fit. The chances are that previous experience has not fitted the operative for this branch of his business, and he mistakes a shade on the iron for a bearing and makes a depression still deeper by misapprehending the "situation." Of course the fallacy of attempting to make a true face in this way is manifest to every one familiar with the subject. It would have been far better to have saved the time wasted in such attempts, and trust to good planing and attendance in future to rectify inaccuracies.

The better way to make a scraper is to form it like a Venetian stiletto, or, more familiarly, after the model of the section of a beech nut; that is, to have the blade triangular in section, and approaching concavity. With such an instrument, properly tempered, ground, and sharpened, the finest work can be produced. A flat-faced scraper is an abomination, and only fit to dig holes or to rough out work for the triangular scraper; it is apt to make "chatters" in the surface; and when these occur we may bid a long farewell to any fine work without filing them out—a very pretty task to undertake after something like accuracy has been attained. Most scraped surfaces are nothing but a combination of scratches, shining blotches, and untruth; and while they are a waste of time to execute, they add nothing to the mechanical value of the work. We may fairly question whether valve seats up to 180 square inches of area, say 15 inches by 12 inches, are benefited by scraping. In some locomotive shops in this country it is the practice to plane the valve-seat so that the tool-marks on it run in one direction, and place the valve so that similar marks in it cross the seat at right angles, and to set the valves running in this way without further adjustment. The results observed are that in a few days the valve has made a seat for itself that is far more durable than if it had been badly scraped. We do not go so far as some persons, and assert that a scraped valve seat is a positive injury, insomuch that the pores of the iron are filled with an impalpable dust that works out to the detriment of the engine in future. This theory is very finely drawn, although it may be partly sustained by facts. A finely-finished mirror-like surface on a valve-seat or lathe shears is indubitably of great value, and we must, in common justice, give credit to English workmen for great skill in this particular; in general they far excel our own workmen.

There is no reason whatever to interfere with the execution of a finely elaborated scraped surface in our own shops; but our observation convinces us that time spent in doing such work as we have seen, might be better employed in some other way.—*Modern Practice of American Machinists and Engineers.*

THE largest photographic portrait lens ever made in England is one of 10½ inches diameter, recently completed and now in the possession of Mr. Mayall, of Regent street. It is an achromatic lens, and will take portraits of any size, from the smallest miniature up to very nearly life size. It is made of glass of the whitest description, and its size admits so large a volume of light that photographs covering a space of 10 inches by 12 inches may be done in eight seconds. In the open air, groups of 15 to 20 persons (each face about the size of a sovereign, and the whole picture 24 inches by 24 inches) can be taken with an exposure of 10 seconds. The cost of manufacturing the lens was upwards of £200.

HOW TO CLEAR LAND FROM LARGE LOGS.—J. S. Stone, of Belvidere, Ohio, in reply to an inquiry recently made for a log-roller to clear new land from logs, states that the best way to get rid of large logs is to blast them with powder. It takes but little powder, he says, and the logs can then be easily handled and put in piles for burning.

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Novelty in Steam Engines and Boilers.

The inventor claims for this device, 1st, that the primary cylinder being within the boiler permits no loss of force from cooling and condensation of its contained steam ; 2d, that the cylinder being beneath the water and lubricated thereby, its inner surface being washed at every stroke of the piston, steam, or the products of combustion, can be used therein at a very high temperature.

He also claims that the form of boiler employed secures the following advantages ; namely, the utilization of the products of combustion, security against the evils of overheating, circulation of water without loss of power, impossibility of the collapse of flues, and economy of water as well as of fuel.

He also claims that by the combination of the primary or internal cylinder with the external or atmospheric cylinder, he secures economy in piston rods, as the pistons of the interior and exterior cylinders, and that of the air pump which supplies air to the furnace, can all be arranged on the same piston rod.

Fig. 1 is a view of the boiler and interior and exterior cylinders with their attachments, and Fig. 2 is a section of the boiler, showing its internal construction.

A, Fig. 1, is the outer shell of the boiler in which is placed the fire-box, B, made of cast iron, in the form shown. The fuel is put in at the door, C, which closes hermetically, and air to support combustion enters through a draft hole when the fire is first kindled, the gases of combustion escaping at first through the pipe, E, and into a chimney in the ordinary way.

As soon as the pressure of steam becomes sufficient to drive an air pump, not shown in the engraving, artificial is substituted for natural draft, by turning the two-way cock, D, a rod for this purpose passing out through the side of the boiler from this cock through a stuffing box. The gases of combustion then pass through the pipe, F, and the pipe, G, Fig. 2, from which descend a large number of open-mouthed small tubes, H, through which the gases of combustion are forced into the water, where they rise and mingle with the steam above the water level.

The operation of the cylinders is as follows : The valve, K,

Fig. 2.

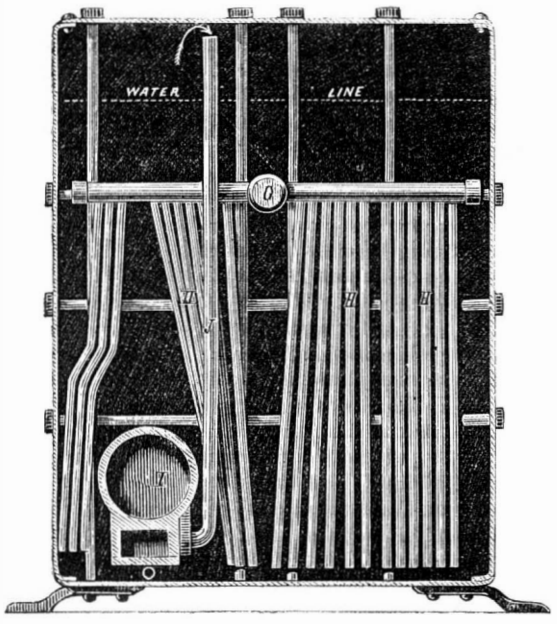


Fig. 1, being in the position shown, allows the contents of the cylinder, I, contained between the piston and the head of the cylinder to exhaust through the pipe, L, into the interior chamber of the exterior cylinder, M, where the expansive force of the mixed steam and gas counterbalances the pressure upon the outside of the piston, through the outer end of M, which is always open, as shown. The pressure of the steam now acting upon the surface of the water in the boiler forces the water into the open end of the interior cylinder, I, forcing the piston outward. As soon as the piston has completed its stroke in this direction, the valve, K, cuts off the exhaust and admits steam to the cylinder, I, through the pipe, J. At the same time the steam in the exterior cylinder, M, which has expanded down to atmospheric pressure is exhausted through the pipe, N, and condensed in the usual manner, the condenser not being shown in the engraving. The pressure of the steam on the side of the piston in I next the valve now balances the pressure of the water on the other side ; and the pressure of the atmosphere on the outside of the piston in the exterior cylinder, M (a more or less perfect vacuum being produced on the inner side by condensation), makes the return stroke, and so on indefinitely, the area of the piston in the external cylinder being made as many times larger than the internal one, as the number of atmospheres pressure maintained in the boiler.

Patented, in the United States (Feb. 15, 1870), and in Europe, through the Scientific American Patent Agency, by Dr. J. E. Culver, Hudson City, N. J.

At the Union Pacific Foundery, Omaha, cast iron of excellent quality has been made with Wyoming coal.

Sir Joseph Whitworth upon Machinery.

At a dinner of the Foremen Engineers recently, Sir J. Whitworth made the following observations : The prosperity of England depends, not only on the produce of her soil and mines, but also greatly on the number of self-acting machines she keeps at work. In proportion to the increase of the latter has been her increase in wealth and power. Our ancestors had very rude implements to work with, but since the introduction of the steam engine the machinists and engineers of England have gone on applying new machines to every kind of industry, until we have arrived at a time when we have an enormous wealth-producing power at our command. The produce of our mines of coal and iron is so abundant that we can convert the raw material we obtain from other countries into an almost endless variety of things, which add to the comforts of all. The wealth derivable from our mines and self-acting machinery goes on without interruption. The produce of the soil everywhere greatly depends on the seasons. Hence the desirableness of having the most extended area for the exchange of our manufactures. The progress that has been made by engineers during the last forty years has been very remarkable, particularly in constructing and making self-acting machinery. Twelve shillings per foot were then paid for the labor of chipping and filing surfaces of iron, which is now frequently done on the planing machine for 1d. By Mr. Bessemer's admirable process, the cost of manufacturing some kinds of steel has recently been reduced to one half, and in some cases to one third what it used to be. The consumption of coal for manufactures has been reduced more than one half; the saving last year on the English railways by locomotive engineers burning coal instead of coke was £1,200,000 sterling. Mechanical and civil engineers, chemists and scientific men are continually finding out new modes of producing wealth, and the owners of self-acting machinery generally go on improving and increasing their productions, from which those who have fixed incomes derive great advantage.

Looking to the immediate future, we may congratulate ourselves on the great opportunities that are arising for the development of engineering enterprise. The cultivation of the land by steam power is greatly on the increase, landed proprietors now seeing the importance of so clearing and improving their estates as to admit of this. The use of horse tramways is being urgently pressed forward, and a large outlay is contemplated. In my opinion they are not suited to the present times, and mechanical engineers have a right to enter their protest, considering the many obstructions there have been for many years past to the employment of road locomotives. If toll gates were abolished, and each county had an organized staff for making and keeping the roads in good order, using the steam roller, steam sweeping machine, and other necessary appliances, where there is large traffic, mechanical engineers would then, I have no doubt, soon produce a small light locomotive that would do its work quietly and most effectively ; at the same time, pedestrians and those who ride and drive would have the great enjoyment of good and clean roads, instead of the present badly paved and rough Macadam roads. The broken stones of the latter are now left for the horses' feet and narrow wheels to consolidate, in a way which it is quite distressing to see. The consumption of fuel for horse-power is now so small that road locomotives could be employed at far less expense than the overworked and ill-conditioned horses we now see ; while pedestrians, and those who keep animals for pleasure would have good roads, and many gentlemen, no doubt, would have their well-made locomotives. Under any circumstances, good, clean roads are the most profitable when everything is taken into account ; but, unfortunately, those who make and repair them generally consider only one side of the question.

Envelopes Made of "Greenbacks."

The Treasury Department annually uses many thousands of envelopes of a peculiar greenish tint, which are rarely seen outside of Government offices. No one, on examining them, would suspect of what they are manufactured. They are strong, smooth, and business-like in appearance, and have the letter "T" stamped through the fiber. Old greenbacks form the material of which they are made. The Treasury Department saves up all the bits and remnants of paper used in the manufacture of our currency, with old stamps and bills and all the mutilated greenbacks which have come back to it, and, instead of destroying this mass of rubbish, as was formerly done, the Departments turn it over to the papermakers, who return it in the shape of serviceable envelopes. Many dollars are annually saved to the Government by this means. These envelopes are used extensively in the Custom Houses, the Post Office, Sub-Treasury, and other Government offices.

Cost of Telegraphy--Europe and America.

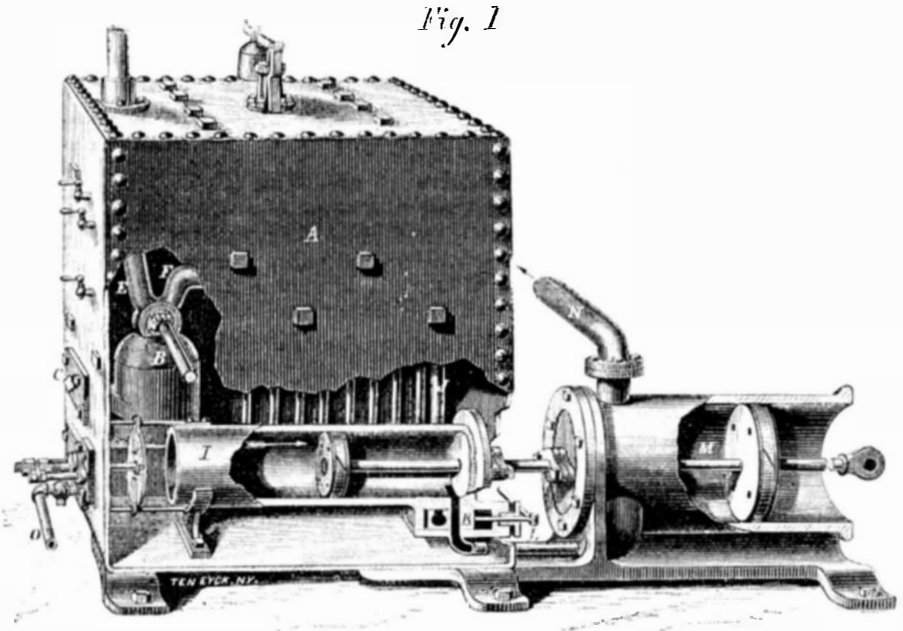
In Switzerland the telegraphs are worked under government auspices, and the charges are less than elsewhere in Europe. But it appears that our system is the cheapest.

In Switzerland the proportion of miles of line to the population is 1 to 940; of wire 1 to 448 ; of offices 1 to 6,000 ; and of internal messages 1 to $2\frac{1}{10}$.

In the United States the proportion of miles of line to population is 1 to 420 ; of wire 1 to 238 ; of offices 1 to 6,000, and of internal messages 1 to 3.

Thus the United States, as compared with the most favored country in Europe, has in proportion to its inhabitants more than twice as many miles of line ; nearly twice as many miles of wire ; an equal number of offices, and sends annually a larger per centage of internal messages. And in spite of the increased cost of the service from competition ; in spite of the high price of labor, which is more than twice as much on a specie basis as in Europe ; and finally, in spite of the high rates of taxation to which telegraph property is subjected in this country, messages are now transmitted throughout the United States in currency at a lower average rate per mile, than in any country of Europe.—*Journal of the Telegraph*.

Fig. 1



CULVER'S IMPROVED STEAM ENGINE AND BOILER.

CONKLIN'S DETACHABLE LIP FOR BOWLS, BASINS, ETC.

Our engraving exhibits one of the legion of applications to which india-rubber has been put in modern times. We judge there are many branches of business, as that of the druggist, dyer, etc., in which, as well as in domestic use, this device will be found serviceable.

Every one knows how difficult it is to pour liquids or semi-fluids from an ordinary bowl or dish without spilling, and thereby wasting the contents and soiling other articles, as table covers, carpets, clothes, etc. To prevent this waste and annoyance, and enable children and careless servants, as well as the trained hand of the druggist, to pour with the certainty of not spilling a drop, this device is intended.

As will be seen, it consists of a rubber lip or nose, which is clasped upon the bowl or other vessel by an elastic band, with sufficient rigidity to prevent the passage of any fluid between the lip and the bowl. The elasticity of both the lip and the band renders the application to different sizes of vessels perfectly easy and secure.

A slight shoulder on the inner side of the lip rests upon the upper edge of the vessel, so that an almost continuous surface from the interior of the bowl to the point of the lip is secured while pouring out the liquid.

Patented, May 12, 1868, by George Raymond, Fitchburgh, Mass. For purchase of State or county rights, or other information, address the patentee, or O. P. Conklin, Worcester, Mass.

Prof. Johnson of the Maine College says; "That the labor system is a benefit to the students is very apparent. Aside from the amount earned, the labor performed keeps up industrious habits, promotes health, is to a certain extent a source of instruction to the student, and prevents that wide disseverance from manual labor and distaste for it which is so observable in the graduates of our old colleges. Besides, we think it plainly observable that a few hours of labor each day makes the student more quiet and studious during the hours devoted to study. The time spent in labor would in most cases be devoted to idle talk and to various kinds of recreation, perhaps of dissipation. Labor is the 'safety valve' for the overflowing of animal spirits. There has been a remarkable willingness on the part of the students to engage in all the kinds of work required to be done."

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Special Notice to Advertisers.

The circulation of the SCIENTIFIC AMERICAN has become so large that we are compelled to put it to press one day earlier in the week. Advertisements must be handed in before Friday noon, to insure their publication in the issue of the succeeding week.

INTERNATIONAL EXHIBITION OF 1871, IN LONDON.

The English Government, profiting by the experience of the past twenty years, have decided to adopt a new system of exhibitions, and instead of holding them every ten years, and making them universal, they propose to have annual exhibitions, confined to a limited number of articles. The past increase of manufactures, and the multiplicity of applications of science to the arts, render a universal show of them at one time, and in one building, next to impossible. The last Paris exhibition building covered nearly forty acres of ground, and the park outside embraced eighty acres more. The number of exhibitors was fifty thousand, and of separate articles there were several millions. The visitors to the palace were counted not by thousands, but literally by millions. It was noticed that the English Commissioners should have been appalled by the prospect in store for them if they were to undertake another World's Fair, in 1871. Nothing short of a building covering a hundred acres, and a park with a hundred more would suffice for the purpose, and then must follow the vast expenditure of money to put things in order at the appointed time, ready for the inroads of exhibitors, who would naturally apply for space. The thing was manifestly not to be thought of, and the Commissioners have wisely decided to hold annual exhibitions open to people of all countries, but confined each year to specified articles. They have asked the co-operation of our Government, and as a preliminary to opening a correspondence with the English Government, the Secretary of State has appointed Mr. N. M. Beckwith United States Commissioner.

Mr. Fish could not have found a better man for the position in this country. Without the energetic and able management of Mr. Beckwith during the Paris Exhibition of 1867, our country would not have been represented at all. He has well earned a recognition of services rendered at that critical period, by this appointment to superintend the proposed co-operation of the United States in the new scheme of annual exhibitions, and if any one can work out the problem practically, it is Mr. Beckwith.

Her Majesty's Commissioners announce that the first of a series of annual international exhibitions of selected works of fine and industrial art will be opened in London, at South Kensington, on Monday, the 1st of May, 1871, and be closed on Saturday, the 30th of September, 1871. The exhibition will take place in permanent buildings, about to be erected, adjoining the arcade of the Royal Horticultural Gardens. The productions of all nations will be admitted, subject to obtaining the certificate of competent judges that they are of sufficient excellence to be worthy of exhibition. The objects in the first exhibition will consist of the following classes, for each of which will be appointed a reporter and separate committee.

1. Fine arts: paintings, sculpture, engravings, architectural models, tapestry, decorative designs, copies of ancient pictures.

2. Scientific inventions and new discoveries of all kinds.

3. Manufactures: pottery, earthenware, wool and worsted, educational manufactures and belongings, such as school buildings, books, maps, toys, and games for physical training, illustrations of modes of teaching fine art, natural history, and physical science.

4. Horticulture: The Royal Horticultural Society will exhibit new and rare plants, showing specialties of cultivation.

One third of the whole available space will be assigned to foreign exhibitors, who must obtain certificates for the admission of their objects from their respective governments. The objects must be delivered free of charge and unpacked at the building, but all expenses of show cases, installation, etc., excepting machinery, will be borne by the Commissioners. It is desirable to have prices and full descriptive labels attached to all articles. Foreign countries appoint their own judges and reporters. There will be no prizes, as the certificate of having obtained the distinction of admission to the exhibition, will be decreed sufficient to reward the exhibitor for his trouble. The arrangement of articles will be in classes, without regard to nationalities, and thus be better placed for study and examination.

Mr. Beckwith, in a recent letter to the Secretary of State, thus speaks of this modified plan of international exhibitions:

"The method proposed will obviously diminish the cost of the exhibition; small exhibitions being less expensive, in proportion, than large ones. The personal expenses of exhibitors and visitors will also be diminished; less numerous bodies being supplied with transport and living, better and cheaper, in proportion, than multitudes, which are often in excess of the means provided. The educational effects are more important. Discoveries and inventions spring up continually in numerous and widely separated localities and countries, and in like manner new applications of science and art are constantly made in the productive industries. But the knowledge of such inventions and improvements spreads slowly. The rapid diffusion of this knowledge by bringing together for study from all countries, their best products, which are the practical expressions of the most advanced sciences, inventions, arts, and industries, is the leading object of international exhibitions.

"The vast accumulations and bewildering varieties of products hitherto collected, and the confusion and excitement incident to great but transient assemblies of persons, renewed daily by departures and fresh arrivals, are unfavorable to study."

Mr. Beckwith estimates the necessary expenses for clerk hire, advertising, stationery, office rent, storage, and reporter, at from ten to fifteen thousand dollars. This is a small sum for so important a matter, and no doubt will be readily appropriated by Congress.

POWER AND EFFICIENCY OF SCREWS.

The screw is a very ancient device, and the fact that in modern mechanism it still holds so prominent a position is proof enough of its essential value. It is true that the hydrostatic press of Bramah has made great inroads upon the domain formerly held by the screw in mechanics; but the probability is that so long as man retains his present ascendency over the forces of nature, it will continue to be one of the chief instruments of his power.

The weight which can be raised by a screw is generally estimated by multiplying together the force applied to the end of the lever, the length of the circumference, through which this force travels, dividing the product by the pitch expressed in the same denomination as the circumference through which the power applied to the lever travels, and subtracting the loss caused by friction. Friction is, however, so variable on different screws, and so dependent upon the materials of which they are composed, their proportions, and the quality of the lubricators employed, that it may be said to be almost a controlling element in the question of power and efficiency.

We have only in view such screws as are intended to raise and sustain, without other appliances, the load they are intended to bear, and shall therefore leave out of the discussion those of abrupt pitch used on die presses, etc.

It is evident that in proportioning a screw to bear a given load the following points must be considered: first, the size of its thread, and that of the nut with which it engages to bear the proposed load; second, the axial pitch, or the distance the screw will advance for each revolution of the lever; third, the abruptness of the incline, or what amounts to the same thing, the normal pitch, or the distance from either the upper or lower side of the thread to the corresponding side of the adjacent coil, measured on the shortest distance between the sides; or to use a term not strictly correct, at right angles with the thread.

The length of a coil of a screw measured on the interior, may be found by squaring the circumference of the cylinder about which it winds, adding to the result the square of the pitch in the same denomination, and extracting the square root of the sum. The result will be the length of the coil in the same denomination as is used to express the circumference of the cylinder.

If a base line of indefinite length be drawn, and the pitch of the screw be laid off from the base line, and perpendicular to it, and an arc be described from the point on the perpendicular where the pitch terminates with a radius equal to the length of the coil, as above calculated, it will cut the base line at a point which, joined to the point taken as the center of the arc described, will complete a right angled triangle, the angle of which opposite to the side which equals the pitch, is equal to the angle formed by a horizontal line tangent to the cylinder and any part of the face of the thread, in a vertical screw of the given dimensions.

This angle diminishes when with the same pitch the diameter of the cylinder increases. When it is subtracted from ninety degrees, the remainder is the angle formed by any part of the upper surface of the thread, and a line erected thereon parallel to the vertical axis of the screw. Friction will increase or diminish with the increase or diminution of the latter angle, the smaller it is the greater the friction, and *vice versa*. As the angle depends for its acuteness on the diameter of the cylinder, it follows that the less the diameter is the more acute will be the angle and the greater will be the friction under a given load.

In other words the power applied to rotate the screw, and the resistance to its motion, act to press together the faces of the coils in the nut and the coils on the cylinder, but the power acts at right angles to the faces, and the resistance in the direction of the axis of the screw. The resultant friction for each revolution may be obtained by multiplying together the coefficient of friction for the material of which the screw and nut is constructed, the diameter of the cylinder plus the width of thread, the resistance, and the decimal 3·1416, and adding to the product the continued product of the pitch, the power applied to the lever, and the length of the leverage, like denominations being used for measurements, and also for weights during the operation.

In the case of a wrought iron screw with a brass nut the coefficent of friction is 0·103, where tallow is used as an unguent; with sperm or lard oil it would be 0·075. With a screw of wrought iron in a cast iron nut it would be about the same. With wrought iron screw and nut, 0·081 would be the coefficent of friction, with sperm oil as a lubricant.

The securing the greatest strength with least friction has been studied, and there is no doubt that the thread is best made so that its vertical section in a vertical screw is a square, and its depth one sixth the diameter of the newel or cylinder upon which it winds.

TELO-DYNAMIC CABLES.

The method of transmitting mechanical power through long distances, by means of wire cables, is daily extending; and there can be no doubt that for more than ordinary distances the plan is a very economical one, in all the particulars of first cost, subsequent expenses for repairs, and working efficiency.

For a long time the question of the best means for transmitting power to great distances has been one of the first importance; and a great number of methods have been essayed to accomplished the desired end, many of which have been at sundry times discussed in these columns.

Experience has shown however that none of these methods can approach in economy the telo-dynamic cable. We have our doubts whether the invention of this method is justly ascribed to M. Hirn, but there is no doubt that to his labors and experiments the development and demonstration of the great advantages of the system are largely due.

At the great French Exposition, M. Hirn exhibited his telo-dynamic apparatus, and it attracted much attention. The secret of its economical application is the transmission of power at high speed, so that both a light cable and light pulleys may be used. In this way a very large working power may be accomplished by a small cable, and although some loss will be sustained from friction in speeding down to the required velocity, the gain in the transmission will more than compensate for all such losses.

Transmission at high speed is not so essential when a small power is to be transmitted through a comparatively short distance, but where the distance is great it cannot be dispensed with. The resistance of the air is also a formidable absorbent of power at high speeds and long distances, and it is probable that a slower motion of the transmitting pulleys, with a larger cable than recommended by M. Hirn, will be found the best practice for distances of less than five hundred feet. Our opinion is that the speed should increase and the size of the cable diminish as the distance and the amount of power to be transmitted increase, according to some ratio which we do not consider as yet fully determined. The velocity of the cable recommended by M. Hirn is nearly a mile per minute, the cable being 0·39 of an inch in diameter.

In the mines of Falun in Sweden one hundred-horse power has been thus transmitted to a distance of nearly three miles, and it is estimated that for much larger distances the loss from all sources in transmission need not exceed twenty-five per cent.

A number of these cables are now working over short distances in this country. Among the ones recently put up is a cable at Lockport, New York, by which twenty-five horse-power is transmitted over a distance of 700 feet, with perfect success, and, we are informed, with remarkable economy. The total length of the cable is 1,484 feet. It is operated with frictioned gears. The cable pulleys are five feet in diameter, and the cable is 15-32 of an inch in diameter.

We regard the introduction of this system as marking an era in mechanics, and opening the way to the utilization of of immense natural water powers, hitherto neglected on account of inaccessibility or other adverse circumstances.

BOILER EXPLOSIONS.

The report of the Midland Steam Boiler Inspection and Assurance Company, for 1869, contains, among much other very interesting and instructive matter, the following paragraph, which we commend to the earnest attention of those who believe in the "inexplicable power" of steam.

"It is observed with regret that boiler explosions are still attributed by those who have given little attention to the facts of the cases to mysterious causes, such as electricity, decomposition of water, explosive gases, etc., and it is believed nothing will better convince those responsible for boilers of the simple causes which lead to explosion, and the easy means of preventing them by due care or inspection, than accurate records of those boilers which have exploded."

Now what is the record. From corrosions 16 out of 59 boilers reported exploded. From *over repairs, patch upon patch,* 12 went up: Low water caused the destruction of 8. Weak tubes without strengthening rings brought 8 more to grief. Want of stays caused the ruin of 4. Weak manhole

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without strengthening rings brought to an untimely end 3 more. One only is reported as having blown up from extraneous causes, and 7 are reported as bursting from unknown causes, or from causes of which no trustworthy particulars could be obtained.

We once heard of an individual of limited education who, when in reading he chanced to stumble upon a long word, escaped the difficulties of pronouncing it by calling it "sundries." So it has got to be the fashion among those who are always ready to philosophize upon what they really know little or nothing about, to charge the explosions of all boilers, of which the causes are unascertained, to an inexplicable force, which covers ignorance of real or probable causes.

There seems a tendency in the human mind to look for supernatural rather than for natural causes of events, and this tendency only diminishes as people become educated to analyze complex occurrences and trace effects to causes. But even with those who are thus educated, there seems to be a charm in a search for some hidden, though it may be natural cause for a phenomenon, so that in their endeavor to detect the remote, they overlook immediate causes altogether.

Now if instead of looking so far for occult forces, owners of steam engines would look for defects in boilers, and not content themselves with once looking, but continue on the lookout for defects that are constantly liable to occur, they would show far more wisdom and suffer less damage.

The appendix to the report alluded to states that the most prevailing evil has been that of "seam ripping where cracks extend from rivet to rivet, until too little sound seam is left to retain the boiler whole. About thirty very dangerous seam rips have been discovered, besides many others where the mischief had commenced." Bad iron, bad workmanship in not matching rivet holes, so that the strain of expansion and contraction has caused rupture, concentration of fierce heat on too small area, deposit of scale, and imperfect circulation consequent upon accumulation of mud, are the causes of this seam ripping.

The practice of expending money in patching and re-patching, and putting patch upon patch, instead of renewing the boiler, is deprecated in strong terms.

The chief cause of corrosion appears to be small leaks, especially where the flues are difficult to enter, or where the boilers are so covered that the leaks do not show.

CHARLATANS AND CHARLATANISM.

Quackery finds its way into all professions. Medicine has been popularly believed to have given birth to more quacks than any other calling; and it is certain that the diseases of mankind, and the intense longing with which the sick yearn for restored health, afford most favorable opportunities for the practice of deception by those who assume knowledge they do not possess.

We have, however, a shrewd suspicion that law, theology, art, literature, and science are not very much more free from pretenders than medicine. We can certainly speak from knowledge as to the great number of quacks who infest the country, and live by palming off upon credulous dupes that they are in possession of some wonderful secret by which they can make enormous savings in various processes; that they have made some wonderful mechanical discovery or invention, which only wants money to develop it into a very mine of gold.

Our experience has brought us into contact with many of these charlatans, and we have got to know them at sight. They generally want us to publish in the interests of science (always in the interests of science) the interesting fact, that they have, by accident, or by long and arduous study, or have had communicated to them by some remote savage, the secret of doing something or other very much better than any one else ever did it before; but when asked how they do it, they decline to give any information. They also generally express the profoundest confidence that their secret is absolutely unfathomable by any living man whatever, and that all attempts to learn the mystery without paying for it, would be as absurd as to attempt a voyage to Jupiter, or to pump melted gold from the crater of Vesuvius.

Now when a man talks about being able to practice publicly an art, the secret of which is impenetrable to anybody, you may set that man down as either an ignoramus or an unprincipled humbug. Or when a man professes to have made a discovery in physical science, which, from its nature, can be only an inference, from a supposition of his own, he is either a self-deceived individual or worse.

Such an individual it was our ill fortune to encounter about six months since, who claimed to have made the discovery that sound is a substance, which permeates all bodies, solid, fluid, or gaseous; and that in order to free this material which its learned discovered called *Sigule*, all that is required is to knock on one end of a beam or wire, and sigule will ooze out of the other end. By means of a peculiar apparatus this charlatan performed an experiment familiar to all scientists, namely, the reinforcement of sound, so that a sound too feeble to be heard without reinforcement is rendered audible.

This man had succeeded in convincing one or two dupes that he had made a grand discovery, and that he could lay a wire across the bottom of the Atlantic, and that by thumping at either end squeeze out *sigule* at the other, and thus supersede the electric telegraph, make untold millions of dollars, and immortalize the names of his patrons.

How, when we are called upon to answer for our sins, we shall be able to justify ourselves for not giving this fellow a fulsome puff—as did more than one prominent journal—is a question which, if we are to believe him; will render our death-bed a scene of horror and despair. Of this sort are the men who profess to be able to make a pound of butter from a quart of milk; who vend soldering fluids of unheard-of virtues, and of hitherto unknown materials; who sell recipes for preventing the cracking of steel in tempering; who search out some simple-minded and ignorant man possessing money, and seek to convince him that with the aid of a few hundred dollars from his purse, they can produce the long-sought perpetual motion; who work upon the ignorance and avarice of others by professing to discover by some chance the place of deposit of hidden treasure; and so on to the end of the chapter.

Many of them profess to have obtained high honors and degrees from some—always remote—institution of learning, and by pompous manner and high-sounding language seek to impose upon the credulous the seeming of wisdom.

The "cheek" of some of these fellows is really little short of the sublime. They will quote you by the hour passages from authors who never existed, and misquote those who have; and we have not unfrequently seen a man of solid attainments completely brow-beaten and cowed by one of these voluble scoundrels.

Apart from consummate brass, and the professed desire to benefit the world by their great discoveries, their chief characteristic is mystery. Whenever you meet a man with a secret by which he expects and hopes to bless the world, and which no one can possibly penetrate, beware! he has designs on your pocket.

EXPERIMENTAL TEST OF THE LAWS OF THE DEFLECTION OF BEAMS.

We are in receipt of an important and interesting paper read at the Eighteenth Meeting of the "American Association for the Advancement of Science," by Professor W. A. Norton, of New Haven, entitled "The Laws of the Deflection of Beams Exposed to a Transverse Strain Tested by Experiment." The laws of deflection are of such fundamental importance in mechanical construction, that our knowledge of them can neither be too full nor too accurate. While, therefore, we cannot make room for the whole of Professor Norton's paper, we will endeavor to give an idea of the experiments from which he derives his conclusions, and a summary of the conclusions themselves.

The experiments were made upon sticks of white pine of various lengths from two to six feet; and various breadths and depths from one inch to four inches. The details of the apparatus are unimportant, save that they should be such as to secure accuracy in the experiments. On this head we will say that so far as we can discern from the minute account given, the apparatus was without any defect that could lead to possible error.

The strain was applied by a screw, the pressure of which was measured by a Fairbanks' spring dynamometer, and the results obtained were confirmed by repetition with a second set of sticks.

Professor Norton starting with the received theoretical formula for the deflection of beams of a rectangular cross section of uniform dimensions, $f = m\frac{Pl^3}{Ebd^3}$, in which m is a constant, P the power applied, E the modulus of elasticity, l the length, b the breadth, and d the depth of the stick, deduces therefrom a formula for the case of a beam resting freely on two supports and loaded in the middle, to which the experiments were entirely confined, *i. e.*, $f = \frac{Pl^3}{4Ebd^3}$ If this formula be correct, then the following laws must be true:

1. The deflection is directly proportional to the pressure.
2. It is inversely proportional to the breadth.
3. It is inverstly proportional to the cube of the depth.
4. It is directly proportional to the cube of the length.

He then gives tables of experimental results which show first, that the deflection is only approximately proportional to the pressure, strictly speaking increasing according to a less rapid law. He suggests as the probable explanation of this descrepancy between theory and fact, "that as the force of pressure increases the neutral axis of the cross section of the stick shifts its position, and its distance from the center of gravity of the cross section augments as the pressure becomes greater. From this cause the moment of the resistance to flexure increases indirectly with the pressure, at the same time that it increases directly from the augmented strains of the fibers. The increased moment of resistance to flexure resulting from this shifting of the neutral axis, should be attended with a diminished increment of deflection for the same increment of pressure."

The second law was verified by the tests, if we except such errors as may reasonably be ascribed to differences in the moduli of elasticity of the different sticks, the shifting of the neutral axis in the case of sticks most strained, and possible errors in observation.

In testing the third law the calculated were all less than the observed deflections; but the errors became smaller as the sticks were increased in length. Professor Norton therefore concludes that "the deflection decreases according to a less rapid law than the inverse cube of the depth."

He also concludes from the results obtained in testing the fourth law, that the deflection increases according to a less rapid law than the cube of the length.

Following these conclusions by a train of reasoning as to the true theory of deflection, which we pass as too abstract for the general reader, he arrives at the formula—

$$f = \frac{Pl^3}{4Ebd^3}\left(4EC\frac{d^2}{l^2}+1\right).$$

in which f represents the flexure, l length in feet, b breadth in inches, d depth in inches, P prsssure, C and E constants which must be determined by experiment. This formula is not easily translated into common language, so as to be unstood by the general reader. The engineer accustomed to regard the laws of flexure as settled, will, however, regard it with interest.

REPORT OF THE NEW YORK COMMISSIONERS OF FISHERIES.

The Commissioners of Fisheries, appointed under chapter 275, of the Laws of 1868, entitled "An act to appoint Commissioners of Fisheries for the State of New York," passed April 22, 1868, have made report for the year 1869, being their second report to the Legislature.

They regret that the act for the protection of the fisheries, prepared by them for the last Legislature, failed to pass. That act provided for a "restriction upon the destruction of the shad in the Hudson river; the size of the meshes of nets would have been limited, and a weekly close-time established, that would have enabled the spawning fish to reach the head waters where they are compelled by nature to deposit their ova." They think that without some such restrictions the restoration of our shad fisheries will be a work of time, on account of the impossibility of getting sufficient mature males and females in proper condition for artificial impregnation.

The Commissioners obtained the services of Mr. Seth Green, the eminent pisciculturist. That gentleman began his operations at Mull's fishery, near Coeymans, on the Hudson; his work was mainly done at night. He would commence drawing the seine for spawners at about eight o'clock, depositing the spawn and melt as he obtained them in pans in his boat, and would stop at about midnight. The impregnated spawn was at once placed in the hatching boxes, each holding ten thousand or more eggs, and left in the current until it was hatched. At every change of tide during the slack water, it was found necessary to shake the boxes to prevent the spawn settling at the bottom and getting smothered. The boxes, which were Mr. Green's patented invention, were one foot by eighteen inches, and were fastened one behind another by ropes attached to floats. They worked, as they have always worked when properly managed, to perfection. The operations were continued until July 13, 1869, when the weather became too warm and the breeding fish so scarce that the enterprise had to be abandoned. Only 15,000,000 of shad were hatched in place of 300,000,000, as could doubtless have been done, had the proper legislation been had. It is possible that these will produce some beneficial effect on the fisheries, but it will not be what it should and could have been, and what it is hoped that it will be this year.

The Commissioners state that the local fishermen have been induced to favor the enterprise rather than to oppose them, as was done on the Connecticut river, and recommend that they be provided with breeding boxes by the State, and be allowed the privilege of using their nets after the commencement of the close season, provided they would hatch the spawn.

The Commissioners have prepared a law to meet the necessities of the case, and ask for its enactment.

The Commissioners state that on the 11th day of November, Mr. Seth Green was dispatched to Detroit to procure the spawn of white-fish, as it was considered that it would be the best locality to obtain them. This conclusion was justified by the result, as millions of eggs could have been obtained when the nets used in catching the mature fish were brought to shore. The first spawn was obtained on the 13th of November; it was impregnated at once, and then packed in moss for immediate transportation, as your Commissioners did not feel justified in erecting a hatching-house for its propagation. Advertisements were put in the New York papers that the spawn would be delivered to all persons desiring it who had facilities for hatching it; and it was rapidly distributed to numerous applicants. However, so much of it was obtained that some was left over, and it was placed in the troughs used by Mr. Seth Green for raising trout at Caledonia. There it throve well, and the fry were soon abundant. Some discoveries were made by the better opportunities thus offered for studying the subject. It was found that the eggs would hatch in sixty-five days, in a temperature of forty-five degrees; that the fry carried the umbilical sack for eleven or twelve days, and that thereafter they lived on precisely the same food as young trout. They did well on lobbered milk, liver, or pulverized meat, and such other nutriment as is usually given to trout fry. It has been generally supposed, heretofore, that white-fish obtained at least a part, if not all, their sustenance from *algæ*, marine plants, grasses, or moss; but the observations of Mr. Green proved this supposition to be incorrect. By careful investigation he satisfied himself that the fish fed on small worms which they found on the plants, and that if they swallowed the plant itself, they did so by accident. These worms are extremely abundant, and the fry would commence devouring them as soon as the umbilical sack was absorbed. The larger fish lived not only on the same worms, but also on fresh water snails, caddies, insects, and other similar nourishment, and were extremely fond of their own spawn. This discovery is sustained by further experiments, and is very valuable, as it determines conclusively how white-fish are to be nourished in their infancy; a matter of great importance to all those engaged in fish culture. Of the results of the efforts of the parties to whom the impregnated spawn was sent, little has been heard at the time this report is made out. The Commissioners remark somewhat severely, "it is found that persons who are anxious to obtain a favor will promptly answer all inquiries, but that when their wishes are gratified they become more careless in their correspondence." Some packages of spawn were transmitted to England, to Mr.

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Buckland, the superintendent of salmon fisheries. They arrived safe, and were thus mentioned in *Land and Water*, the journal edited by Mr. Buckland.

The observations of Mr. Green also led to another important discovery. He noticed that the young fry were often taken in a delicate web that some creature appeared to spin in the water, a web similar in general appearance to that which the spider weaves, but composed of more delicate threads. This, he ascertained, was the work of a worm which attaches it at the necessary number of points, and then passing back and forth completes it with remarkable rapidity, and of a size larger than a spider could make it in one night. It is very fatal, holding the fry securely if they happen to touch it, and killing larger fish, by sticking to their sides and gills. The fry have been seen to touch it with their heads, which would then remain fast, their efforts to escape would soon entangle their tails, and then they would be entirely helpless and destined to immediate death. This web is probably often mistaken for *byssus;* when seen on full grown trout, it is delicate, resembling the threads of frog spawn. It seems to be more common in still water, a current interfering with the proceedings of the worm. No young fish that enters the web ever escapes from it or can be taken from it, and it cannot be removed from the gills or sides of those of larger growth. The worm is a native of most of our ponds and lakes, and can be suspended by its web like the measuring worm hanging from the limbs of a tree. It has somewhat the appearance of a measuring worm and moves in the same way. It has two legs on the back part of its body but none forward, and is usually about half an inch long. The Commissioners consider this a most important subject of consideration for all pisciculturists, and desire to call the attention of naturalists to it.

It is recommended that a fish pass be made at the dam above Troy, so that the waters of the upper Hudson may become stocked with shad, as was the case before the dam was built. They report $7,873·83 still unexpended out of the $11,000 originally appropriated, and estimate that $10,000 additional, would enable the Commissioners to carry on their work effectually, and probably to build the needed fish-pass at Troy, if they should be authorized to undertake that work.

Painting Plastered Walls.

Painting plastered walls is often botched. According to a writer in the *American Builder*, the following is the proper way to proceed. White lead ground into a thick paste, is reduced by mixing it with linseed oil to the consistency of cream, adding as a dryer a little litharge ground in oil, and also a little coloring matter. This is called the priming, or first coat of paint. If, on applying this, the plaster is found to be absorbent, so that in passing the brush over it in spreading out the priming, the oil is so quickly absorbed as to leave the white lead rough and dry upon the surface, more oil should be added to the mixture, in order that the plaster may be deeply saturated, as the more the oil sinks in the better.

There is a practice among painters which in some cities, where prices of work are much reduced, prevails to a great extent, which is as follows: They wash over the plaster and wood-work with a weak solution of glue called size, before the application of the first coat of paint. This prevents the absorption of the oil, and causes the paint to spread over a much larger surface than it would do without this preparation. This practice is much to be deprecated, as it is very injurious to the work, especially to the plaster, by depriving it of that hardness which the absorption of linseed oil produces. We will suppose, then, the priming to have been properly mixed and applied; a few days must then be given it to dry before the second is applied. The second coat should be made thicker than the first, but its particular degree must depend upon the degree of absorption that has taken place in the first coat. Sometimes a great portion of it bears out—that is, dries out with a gloss—in which case the second coat ought to have a good body of white lead in it; if not, then the second coat ought to be kept rather thin, as it is of the first importance to have the plaster thoroughly saturated with the oil. Before applying this coat, the work ought to be well rubbed with fine sand paper. If the second coat bears out properly when dry, the third coat will form the ground work for the finishing process; but, should it not bear out properly, the work will require to have five coats, and, therefore, another coat of oil paint must be applied.

The ground work for finishing upon is composed of white lead, diluted with equal parts of linseed oil and spirits of turpentine, the thinness of the latter enabling a much greater body of white lead to be held in solution, and thus increasing the density of the paint. Into this, such ground colors are put as will alter the white paint to a tint of the color in which the work is to be finished, along with a little sugar of lead as a dryer. This tint should be made a little deeper than that intended for the finishing coat, by which means the solidity and durability of the color is increased. The thicker this coat is made, and the more it is spread out with the brush, the more durable will be the work, and the finer will be its surface. This ground color is generally dry enough on the second day after it is applied, and should not stand above a few days, as, if it becomes too dry, it prevents that incorporation of these coats, so essential to equality in the opacity or deadness of the surface, and to the solidity of the tint.

The finishing coat is white lead, in a state of thick paste already described, but diluted with spirits of turpentine only, and mixed with such colors as will produce the required tint, to which is added a little dryer. This species of paint, when of a light tint, is of great density, and from the volatility of the spirits of turpentine, it soon thickens after leaving the brush. Great precision and dispatch must be employed in applying it; the process is called flattening. This is the only coat that meets the eye in the finished work, and the spectator cannot, by looking at it, have any idea of those that are underneath, and upon which the durability of the work principally depends. This under-work may be worth two dollars a square, or it may be worth six, and the surface of the finishing coat look equally well. This, as well as the quality of the pigments used, sufficiently accounts for the variable durability of paint-work—some houses requiring to be re-painted in four or five years, while others require little more than washing for twenty-five or thirty years.

In almost all that kind of work, improperly called cheap painting, as in all cases where the painter agrees to furnish work on three coats of paint, a coat of size is introduced between the second and third coats. This is not so destructive to the character of the work as the application of size before the first coat; but it is bad enough, and is a practice that ought not to be resorted to. It is this practice that so frequently, in re-painting a house, causes the necessity of removing the old paint entirely, because if this be not done, the coats of the old paint separate where these sizings have taken place, and come chipping off with the new painting which has been put above them. Thus, a heavy extra expense is incurred, when a considerable saving ought to have been effected; for good old painting, when properly polished down, forms the best ground work for new painting. Another very bad custom is prevalent, namely, that of laying flat paint upon flat paint, without an intermediate coat of oil paint. This is frequently done to save a coat of paint when a house is re-painted. Work so treated will chip and blister until the whole is removed.

Editorial Summary.

SOUR LAKE is the name of a water area of about five acres in Hardin county, Texas. This lake, according to the *American Exchange and Review*, derives its name from the acidity of its waters, which issue from springs both at its bottom and the adjacent shore. The acidulous properties of Sour Lake are derived from decomposition of the underlying aluminous and pyritiferous shales, by which sulphuric acid is set free, and becomes mingled, along with other mineral ingredients, with the water which percolates the strata. The astringent taste of some of the springs is due to the alum they contain. Petroleum is also present; its source may be found in the decomposition of lignite beds and bituminous shales. On the southern shore, near the lake margin, are a number of acid springs or wells, which, although separated from each other by intervals of only a few feet, present considerable diversity, both in temperature and relative proportion of mineral ingredients.

A SUBSTITUTE FOR PLATE-CLEANING.—Dr. Arno Glimm states that "all cleaning of plates in photography is unnecessary if a small quantity of castor oil be added to the collodion; the latter will then adhere uniformly over the surface of the dry and dust-free glass plate, without the risk of any so-called cleaning stains being formed. The amount of castor oil to be added is regulated according to the consistence of the collodion, but no particular care in measuring or weighing is necessary in the matter; as a general rule a teaspoonful of castor oil will be sufficient for a pound of iodized collodion." The use of castor oil in collodion is quite old. It is employed to toughen the film, and assist its removal in transferring processes. We doubt its utility for the purposes suggested above.

FIRING SHOT FROM ROCK-CUT MORTARS.—A recent experiment was tried at Pembroke Camp, Malta, of firing a large stone shot from a mortar excavated for the purpose in the hard limestone rock. The shot was 67 inches in diameter, and was ejected to a distance of upwards of 400 yards, rising so high in the air as to look no larger than a cricket ball. It was intended to fire off another shot of the same description, and a second mortar had been prepared with that object; but it being cut too near the first one, the force of the explosion split the intervening rock, and prevented any further experiments of the kind that day. These stone mortars remind us of the gigantic ones made by the Knights of St. John, and intended to throw a shower of stones or *mitraile* on the heads of an enemy attempting a landing on the coast. Some are still to be seen in the creeks and bays of the island, and are well worth a passing inspection.

LIQUID GLUE.—To 1 oz. of borax in a pint of boiling water add 2 ozs. of shellac, and boil till the shellac is dissolved. Another—Dissolve 8 ozs. of the best glue in half a pint of water; that being done, add slowly, and keep stirring, 2½ ozs. strong aquafortis. Keep well corked ready for use. Another—A useful glue for fastening papers together only by being wetted by the tongue is made as follows: Dissolve 1 pound of glue or gelatine in water, and half a pound of brown sugar, and boil them together. Make into cakes by pouring into shapes. It becomes solid when cold.

ANTI-RUST VARNISH, OR VARNISH FOR IRON AND STEEL RODS.—Take the following ingredients, 1, 2, 3, in a pounded condition, and digest them by a regular heat till melted, then add the turpentine very gradually, stirring all the while: 1. Resin, 120 parts. 2. Sandarac, 180 parts. 3. Gum lac, 60 parts. 4. Essence of turpentine, 120 parts. The mixture should be digested until dissolution; then add—Rectified alcohol, 180 parts. Filter through fine cloth, or thick bibulous papers, and preserve in well-stoppered bottles or cases. It will be found very effective in preserving things from rust.

THE great ports of the Mediterranean—Genoa, Venice Marseilles, and Trieste—with Odessa in the Black Sea—and no doubt all the little ports along with these—have been touched with new life by the Suez canal and the prospects of a large cotton trade between Bombay and the old European west. Genoa has already ordered a magnificent steamer to be built at Jarrow, in England, for that trade.

TEXAS STATE FAIR.—The grand State Fair of the Agricultural, Mechanical, and Blood Stock Association, of Texas, will commence on Tuesday, May 17th, 1870, and continue four days. It will be held at the Magnolia Fire-Proof Warehouse and adjoining grounds, in the city of Houston. Mr. E. L. Massie is the Secretary and Treasurer.

DURING the month of March there were eighty-nine fires in New York, causing an aggregate loss of $382,241, on which there were $2,017,600 in insurances.

NEW BOOKS AND PUBLICATIONS.

LONG-SPAN RAILWAY BRIDGES. Comprising Investigations of the Comparative, Theoretical, and Practical Advantages of the Various Adopted or Proposed Type Systems of Construction, with numerous Formulas and Tables, giving the Weight of Iron and Steel required in Bridges, from 300 feet to the Limiting Spans. By B. Baker. Illustrated by Plates. Reprinted from Engineering. The whole carefully Revised and Extended. Philadelphia: Henry Carey Baird, Industrial Publisher, No. 406 Walnut street. Price, by mail, free of postage $2·00.

The aim of the author of this treatise has been to make a comprehensive rather than an elaborate inquiry into the various elements which should govern the construction of large spans. He defines a long span to be one which is more than three hundred feet. The types discussed are those known as Box girders, Bowstring girders, Straight-Link girders, Lattice girders, Cantilever, Cantilever Varying Depth, Continuous, Arched-Rib, Suspension with Stiffening girder, Suspended girder, etc. The discussion is followed by tables, and a summary of results. This work is one of sterling merit, and is a valuable contribution to engineering literature.

WONDERS OF GLASS MAKING IN ALL AGES. By A. Sauzay. Illustrated with Sixty-three Engravings on Wood. New York: Scribner & Co.

This is an entertaining and popular description of glass making and working in all its departments. It gives a description of some of the most wonderful structures ever made of glass, with some very handsome engravings of glass work. The work cannot be said to be in any sense scientific, but it will serve to give a tolerably correct outline of the subject to readers of all classes, and without technical acquirements. This being the aim of the work, we can say that we think it well calculated to subserve its purpose.

WE are in receipt of the "Miner's Journal" for 1870, containing the coal statistics for the year 1869. Together with an article on the causes of high prices of anthracite coal in 1868 and in 1869. A tabular statement of the coal trade from its commencement, statistics of the iron trade, etc. Price twenty-five cents. Published at the Miner's Journal Office, Pottsville, Pa. Sold in New York by D. Van Nostrand, 23 Murray street.

PATENT OFFICE DECISION.

In the matter of the application of Isaac A. Sheppard for letters patent for a design for a stove ornament.—This case is referred to me by the Primary Examiner upon the following statement:

"In this application for patent for design of Isaac A. Sheppard, filed February 24, 1870, are found two claims—one for the central figure (which constitutes the gist of the case), when cast on and forming a part of a stove plate, and the other for the central figure and surrounding ornaments.

"In dealing with this case, the Examiner finds that it has not been the usual practice of the Office to allow more than one claim in an application for a patent for a design.

"The reasons generally given to sustain this course of action are, that a design is a complete and individual device or ornament, and as such must be exact and perfect in every form, line, or configuration, the slightest deviation from what is represented operating to make a new design.

"The law evidently makes no such inflexible rule of official practice. In the Bartholomew case (Commissioner's Decisions, 1869, p. 111), it is observed that a certain reasonable and proper latitude is given in judging what does and what does not breathe the spirit of the invention in any given case, and that mere colorable variation is to receive no more countenance or favor in an application for a patent for a design than it would in an application for a mechanical device.

"But while the Examiner is impressed with these views, he is unwilling in his first decisions, in applications of the present character, to overrule, so far as falls within his jurisdiction, the generally-settled custom and rule of the Office in the above particular. He desires, therefore, to refer the whole matter to the personal consideration of the Commissioner, as a question of Office practice, for his decision or direction.

"L. DEANE, Examiner."

I agree with the Examiner that there is no provision in, or fair construction of, the acts relating to letters patent for designs, which forbids the union of two or more claims or clauses of claim in a single patent. I am at a loss to know upon what ground such a construction can be asserted or maintained. If the design contains features which are new, singly, and in combination, no reason is known to me why they may not be so claimed.

But, the practice of the Office has not been so uniformly adverse to the granting of double claims, as seems to have been supposed. On the contrary, letters patent for designs containing more than one claim were granted in the years 1855, '57, '58, '59, '60, and '62, and doubtless in the succeeding years, if time had permitted a further examination. Among these, special reference is made to the patent granted to Apollos Richmond, in 1859, which contains one claim for the configuration of a stove plate and another for the ornament upon the same plate; and to the patent granted to Isaac B. Woodruff, in 1862, for a design for a clock case, which contains one claim for the configuration of the whole case, and another for a gilt frame, forming a subordinate part of the same whole.

These cases fully justify the claims presented in the present application, which may therefore be allowed, both upon reason and precedent.

(Signed) SAMUEL S. FISHER, Commissioner.

March 8, 1870.

UNITED STATES CIRCUIT COURT AT NEW ORLEANS.

A. C. Twining vs. *Bujac and Girardey.*—This is a suit brought by Prof. Twining, of Yale College, New Haven, Conn., against Bujac and Girardey, of this city, claiming damages to the amount of $200,000 for making and using machines substantially according to letters patent granted to the plaintiff, for an improvement in the manufacture of ice; and for further damages claimed to amount to $100,000 for profits unlawfully realized by them by vending to others for use the process and invention described in said letters patent.

Defendants' answer sets forth that plaintiff was not the original and first inventor of said process, and denies the novelty of the invention secured by the letters patent referred to.

The trial of this case has commenced, and develops already very many points of chemical and mechanical interest. The defendants have manufactured and sold machines under the French patents of Carré and Mignon & Rouart, and have vended to others the rights of using those patents.

The plaintiff introduced evidence to show that defendants have already realized large sums from their alleged infringement, and also the evidence of Prof. St. John, of the College of Physicians and Surgeons of New York city, and that of President Barnard, of Columbia College, of New York, tending to show that the last-named patents (Carré and Mignon & Rouart), of 1860 and 1865, in this country, are obvious infringements of the plaintiff's American patent of 1853. The plaintiff's individual testimony concerning the origination and development of his own plan; that of Prof. St. John, who saw its working at Cleveland, Ohio, where the first results were produced under it; and that President Barnard, who speaks of the relative working of the principles of plaintiff's and defendants' inventions, after having seen the latter in full and successful operation at the late Paris Exposition—are peculiarly interesting to all scientific persons, as well as to residents of our city, where the daily use of manufactured ice has become a necessity of existence.

Yesterday the plaintiff examined in open court D. Pochelu and H. C. Millandon, of the Louisiana Ice Manufactory, and the defendant Girardey, as to the amount realized by the alleged infringements; and Dr. J. Albrecht, of New Orleans, as an expert upon the various points of infringement. The defendants introduced the testimony of witnesses examined at Cleveland, Ohio, and Brooklyn, N. Y., as to the practical operation of various machines constructed by the plaintiff. Here, for the closing of testimony and argument, the case was adjourned to some day to be fixed by the court.

A. B. Long and Billings & Hughes attorneys for plaintiff, and Johnson & Denis, of this city, and Geo. Harding of Philadelphia, represent the defendants.—*New Orleans Times.*

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Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

476.—INSTRUMENT FOR DETERMINING THE ALTITUDE AND ZENITH DISTANCE OF CELESTIAL BODIES.—H. Colby, New York city. February 17, 1870.

511.—PNEUMATIC ENGINE.—J. S. Morton, Philadelphia, Pa. February 21, 1870.

317.—TREATING IRON.—Wm. Fields, Wilmington, Del., and J. M. Roberts, Burlington, N. J. February 3, 1870.

395.—APPARATUS FOR FRINGING WOOLEN FABRICS.—N. Wheeler, Bridgeport, Conn. February 10, 1870.

401.—LOOM.—J. A. Bassett, and J. R. Norfolk, Salem, Mass. February 10, 1870.

407.—SPRING SEATS AND BED BOTTOMS.—J. L. Whipple, Detroit, Mich. February 11, 1870.

459.—VEGETABLE PARCHMENT.—C. Campbell, Buffalo, N. Y. February 16, 1870.

523.—SPRINGS FOR CARRIAGES, ETC.—A. J. Dexter, North Foster, R. I. February 23, 1870.

570.—PADDLE WHEEL.—A. Wingard, San Francisco, Cal. February 26, 1870.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

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Manufacturers of washing machines are requested to send illustrated description to Postoffice Box, 3322.

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A good business for a machine shop.—The right to manufacture, on royalty or otherwise, a first-class article already introduced; demand unlimited. Address Wm. Johnson, Lambertville, N. J.

The Pew Hat Rack.—E. S. Blake, Pittsburgh, Pa.

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Important advance on the draft and easement of carriage. See Jackson's Patent Oscillating Wagon, with tests of draft, models, etc., No. 149 High st., Newark, Essex Co., N.J. See Scientific American, Sept. 25, 1869.

Photographs.—Rockwood & Co., 839 Broadway, for five dollars, make 8x10 photographs of machinery or views within the city.

1250 lbs. portable platform scales, $25; hay scales, 4-tun, $75. Send for free price list, No. 373. Edward F. Jones, Binghamton, N. Y.

American Boiler Powder.—A safe, sure, and cheap remedy for scale. Send for circular to Am. B. P. Co., P. O. Box 315, Pittsburgh, Pa.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Needles for all sewing machines at Bartlett's, 569 Broadway, N Y.

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If you don't use the Patent Lacing made J. Sweetman, Utica, N. Y., you miss it.

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To Manufacturers and Patent Right Dealers.—The entire Patent, except one State, for sale. Price, $500. Address Lock Box 99 Pontiac, Mich.

General Agency for the Sale of Patented Articles. Address H. Turner, 10 Larned street, Detroit, Mich.

Brick-Making Machine Wanted. Address A. G. Hunter, Jackson, Mich.

Machinery Depot of Chas. Place, & Co., 60 Vesey st., N.Y. Apply for printed lists, 2d-hand Iron and Wood working Machinery.

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Brick and Tile Drain Machine—First Premium in Ohio, Indiana, and Missouri; also Fair of American Institute, New York. Address Thos. L. Cornell, Derby, Conn.

Asbestos—Wanted by J.N.Clarke, 126 Dearborn st., Chicago, Ill.

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Hackle, Gill Pins, etc., at Bartlett's, 569 Broadway, New York.

Portable Pumping or Hoisting Machinery to Hire for Coffer Dams, Wells, Sewers, etc. Wm. D. Andrews & Bro., 414 Water st., N. Y.

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves

For tinmans' tools, presses, etc., apply to Mays & Bliss, Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

Two 60-Horse Locomotive Boilers, used 5 mos., $1,300 each. The machinery of two 500-tun iron propellers, in good order, for sale by Wm. D. Andrews & Bro., 414 Water st., New York.

Prang's Chromos, celebrated for their close resemblance to oil paintings. Sold in all Art Stores.

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I can inform any one interested of hundreds of Wheeler & Wilson Machines of twelve years' wear, that to-day *are in better working condition than one entirely new.* I have often driven one of them at a speed of eleven hundred stitches a minute. I have repaired fifteen different kinds of Sewing Machines, and I have found yours to wear better than any others. With ten years' experience in Sewing Machines of different kinds, yours has stood the most and the severest test for durability and simplicity.

GEO. L. CLARK.

Lyndenville, N. Y.

The Advertisers Gazette,

Issued by G. P. Rowell & Co., Advertising Agents, No. 40 Park Row, New York, contains much information not to be obtained elsewhere. Every advertiser should read it. Sample copies by mail for 15 cents.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

All reference to back numbers should be by volume and page.

R. L. A., of N. C.—According to the modern theory, heat is produced in combustion by the conversion into heat motion of the molecular forces pre-existing in the substances which, by the energy of their chemical combination, produce the phenomena which together characterize what we call combustion. The material idea of heat is one of the oldest notions entertained in regard to it. This theory gradually gave place to the theory that heat was a force, which in its turn has given way to the theory accepted by most of the leading physicists of the present age, that heat is merely a mode of molecular motion. To use the words of Helmholtz, "heat is a shivering motion of the ultimate particles of bodies." This motion throws the particles under certain circumstances so widely asunder as to counteract the action of cohesive attraction, and convert solids into fluids or gases, or fluids into gases. Tyndall's lectures on "Heat as a mode of Motion" will give you all the reasons for supposing this to be the correct theory.

J. R. P., of W. Va.—To determine the size of a Giffard's injector, it is necessary to know the pressure of steam in atmospheres, the diameter of the throat in inches, and the number of gallons required to be delivered per hour. Then divide the number of gallons required to be delivered per hour by the square root of the pressure in atmospheres, and extract the square root of the quotient. 0·0158 of this root will be the diameter of the throat of the injector in inches. To find the delivery, multiply the diameter of the throat in inches by 63·4, square the product, and multiply by the square root of the pressure in atmospheres. The result will be the delivery in gallons per hour. The injector will not work with feed water above 120° Fahrenheit.

J. A. T., of Mass.—A blower does not draw the air in. It forces the air out of the shell by virtue of the centrifugal force it imparts to it, and the pressure or weight of the external atmosphere forces in air at the center, to supply the partial vacuum thus created. The trial by pressure gages at the late Fair of the American Institute, showed that the pressure generated by the first fan in Clark's Multiplying Pressure Fan Blower was equal to that of a single fan of like dimensions and speed, and the increase of pressure for each subsequent fan was exactly equal to the pressure generated by the first fan. The results stated in our article were correct.

H. C. S., of La.—The process of the manufacture of rubber goods as now conducted, employs neither solvents nor fusion. The crude rubber is kneaded with a proportion of sulphur till it assumes the consistence of dough. It is then molded into the desired forms, and vulcanized by subjecting it to from 250 to 300 degrees of heat, for several hours. You cannot treat it in the manner proposed. Pure rubber may, however be dissolved in pure oil of turpentine, or benzine, but when it hardens by the evaporation of the solvents, it does not become as hard as before its solution.

U. S., of Ga.—Gas made from naphtha or light petroleum products may be used with as much safety as ordinary illuminating gas, with the proper apparatus. None of these hydrocarbons are explosive in themselves. When explosions occur in their use, it is because of the ignition of explosive mixtures of their vapors with air or oxygen. The mixtures used in machines for making illuminating gas from gasoline, etc., do not have enough air in them to explode. We regard some of these devices as perfectly safe.

P. J. F., of N. Y.—We do not get your meaning clearly. What is to drive the blowers designed to supply air to your boilers? Compressed air can be used as a motor, and obeys the same laws as steam in non-condensing engines. If your question is whether a run of millstones could be driven with compressed air in a twenty-five-horse power engine, we answer Yes.

S. S. G., of Mass.—Your theory of terrestrial magnetism is the accepted one. The fundamental reason why a magnet assumes a position at right angles to an electric current, has not yet been discovered. If a bar or needle is placed parallel with a conducting wire, its opposite sides have opposite polarites.

J. W., of Mass.—A non-expansive steam engine driving 10-horse power will, on the average, consume about one sixth of a cubic foot of water per minute. As you do not state whether the steam is used expansively or otherwise, we cannot give you any more definite answer.

B. B. C., of Mass.—A 16-inch fan will do the work of a 24-inch fan, if the width of the wings of the 16-inch fan are made 2¼ times the width of the 24-inch fan, and the speed of the 16-inch fan be 15 per cent faster than that of the 24-inch fan.

A. P. S., of N. Y.—We think if you wish to run a train of clockwork with a uniform motion, the best regulator is a small fan wheel, like that used on the striking movement of clocks, in music boxes, etc.

L. F. D., of Md.—Oil cups in the cylinders of any but large horizontal engines are unnecessary. In such engines we consider them essential.

M. B. C., of N. Y.—We think you might run your engine up to 120 revolutions with a saving of fuel for the same work.

J. S. B., and others, of N. J.—You will find your query answered to D. B. S., of Mass., in No. 15, current volume.

Caveats are desirable if an inventor is not fully prepared to apply for a patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Patent Office fee on filing a Caveat, $10. Agency charge for preparing and filing the documents from $10 to $12. Address MUNN & CO., 37 Park Row, New York.

CITY SUBSCRIBERS. — The SCIENTIFIC AMERICAN will be delivered in every part of the city at $3·50 a year. Single copies for sale at all the News Stands in this city, Brooklyn, Jersey City, and Williamsburgh, and by most of the News Dealers in the United States.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

WOOD TURNING LATHE.—J. J. Urmston, Rahway, N. J.—The invention consists in the combination with an ordinary lathe of a large, slowly revolving drum or cylinder parallel with the spindles of the lathe, and carrying cutters, against which the block in the lathe is revolved at great rapidity, and reduced to the required form. Each of the said cutters being arranged for its special part of the work, which it accomplishes wholly at one operation, and only one tool is in operation at a time, one moving up to the work as the preceding tool passes away. The said tools are adjustable on the cylinder for turning different articles, and the lathe is adjustable to or from the cylinder; it is also provided with sliding tools for cutting off the ends of the work.

WATERPROOF COMPOSITION FOR HARNESS LEATHER, AND OTHER PURPOSES.—John Herold, Omaha, Neb.—This invention relates to a new and useful improvement in a composition for leather, and for all the purposes for which it is adapted.

DEVICE FOR LIGHTING GAS BY ELECTRICITY.—W. J. Morris and Wm. J Reid, New York city.—The object of this invention is to light a suitable number of gas jets with a battery, which is but little more powerful than would be required to light one and overcome the resistance of the main conductor.

CARRIAGE PROP.—Leonard Sawyer, South Amesbury, Mass.—This invention has for its object to so construct a carriage prop that the nut at its end for holding the stays or rods in place cannot be worked loose by the swinging of the same or the prop, during the expanding and folding together of the carriage tops.

WASHING MACHINE.—J. K. Derby, Jamestown, N. Y.—The object of this invention is to provide a cheap, durable, and effective machine for washing clothes by the rubbing process, and it consists in operating a rubber plate of wood, or other suitable material, on a bed composed of rollers, by means of levers and jointed arms or rods.

BRICK MACHINE.—F. L. Clarke, Oakland, Ill.—This invention relates to improvements in brick machines, whereby it is designed to provide a simple and efficient arrangement for delivering the ground clay to the molds, and pressing it therein, and for applying and removing the said molds.

BUTTER WORKER.—O. L. Dow, Hancock, N. H.—This invention relates to improvements in apparatus for working butter, and consists in the application to a table standing lower at one corner than the others, and having gutters along the two sides converging at the said lowest corner, of a horizontal turning butter board, and a butter working hand lever, having a fulcrum adjustable as to hight, and connected to the fulcrum in a way to prevent turning, also so that it may be held up above the butter when refined by the said connection.

LEATHER SCOURING AND SETTING MACHINE.—A. W. Reid, Schenectady, N. Y.—This invention relates to a new machine for "scouring" and "setting" leather with greater rapidity, and on a more economical plan than was heretofore in use. The invention consists in securing the scouring or setting tools, whether they be made of metal, stone, glass, or other suitable materials to arms that project from the rim or edge of a wheel or disk.

RAILROAD STATION INDICATOR.—Edward Conley, Cincinnati, Ohio.—This invention relates to improvements in railroad station and distance indicators, and consists in an arrangement of an endless belt whereon the names of the stations and the distances are placed on a system of rollers, adapted for working belts of great length within a small space, and arranged, for regulating the tension and for adjusting the belt relatively to the opening through the case, so as to bring the names on the belt properly before it. The invention also comprises a double acting pawl and ratchet, an arrangement by which the belt may be moved back and forth according to the movement of the car on the road.

CARRIAGE CLIP.—Leonard A. Johnson, Candor, N. Y.—This invention relates to improvements in clips for the attachment of shafts and poles of light carriages to the axles, and consists in an improved arrangement of open boxes or bearings in the ears of the clip, for the trunnions or journals of the shaft or pole, a detachable cap, and a spring for holding them in place. It also consists in an arrangement of the detachable plate which connects the two ends of the yoke below the axle, to prevent it from falling off in case the nuts on the screw-threaded ends of the yoke work off.

BISCUIT PANS.—J. C. Milligan, Brooklyn, N. Y.—This invention relates to improvements in connecting small biscuit pans together in clusters, and consists in attaching them in rows, in straight zigzag, curved, or diagonal lines, by connecting them by riveting to narrow strips or bars of metal placed on the bottom, and connecting the edges of the tops which are so placed as to touch, by riveting through the sides, or by strips riveted or otherwise connected to the edges or sides of the pans, or, in some cases connecting them at the tops only, dispensing with the strips at the bottom, or, the strips only may be used as the means of connection, without connecting the edges at the top.

POLISH FOR CLEANING PLATE AND GLASS.—Hermann Teats, Ann Arbor, Mich.—This invention consists of an improved composition of matter for cleaning and polishing metal and glass wares.

WATER WHEEL.—John Buzby, Moorestown, N. J.—This invention consists in the combination of a series of direct-acting vertical buckets on the outside of a water wheel with a concentric series of reacting inclined buckets next within extending below the direct-acting buckets, and independent of the outer series, by which arrangement the inventor is enabled to employ a larger number of vertical buckets than as though they formed part of the same series with the inclined buckets, and thus extract more power out of a given amount of water, and, at the same time, secure it an ample vent between the buckets of the inner series.

HORSE COLLAR.—George Horter, New Orleans, La.—This invention consists of a horse collar formed of a seamless envelope of some textile fabric inclosing a suitable stuffing.

ELECTICAL ATTACHMENT TO BOOTS AND SHOES.—Joseph Fanyou, Bridgeport, Conn.—This invention has for its object the production of an electric current between the earth and the foot of an individual wearing a boot provided with the inventor's electrical attachment, for the purpose o preventing such foot from becoming cold.

COMBINED TOOL.—Robert Stout, Matteawan, N. Y.—This invention has for its object to furnish an improved combined tool, designed especially to be carried by those driving horses, for convenience in fastening the shoes or removing stones or other substances that may have lodged in the horses' feet.

WASHING MACHINE.—Joseph Balsley, Bedford, Ind.—This invention has for its object to furnish a simple, strong, durable, and effective washing machine, doing its work quickly and well, and which shall be so constructed that the box or tub may be conveniently tightened to compensate for any shrinking of the timber.

ANIMAL TRAP.—Eder E. Haughwout, New York city.—This invention has for its object to furnish an improved animal trap, simple in construction and effective in operation, and which shall be so constructed that the animal in trying to escape shall fasten itself in a receiving chamber or cage, and, at the same time, set the trap for another animal.

CARRIAGE WHEEL HUB.—Wm. J. Arrington, Louisville, Ga.—This invention consists in having the hub made in two parts provided with tenons and mortises, into and between which the spokes are clamped by bolts passing longitudinally through every third or fourth space intervening between the spokes. Fitted to the hub is an axle box provided at one end with a collar which enters a recess in the inner end of the hub, and at the other end with a screw thread and nut which serve to secure the two parts of the hub together, but not so but that they may be separated to allow of the insertion or removal of one or more spokes without unrimming the wheel.

FINISHING CULTIVATOR.—Benjamin Johnston, New Iberia, La.—This invention has for its object to furnish a simple and convenient machine by means of which plants planted in hills, or drills may be "laid by," or finished, and which wil do its work rapidly, uniformly, and well.

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HARROWS.—Wm. Tuttle, Fayette, Miss.—This invention consists in the combination with that class of harrows which are made to rotate horizontally on the connection with the draft apparatus of a horizontal shaft, traversing the axis of the harrow, carrying with it a rapidly rotating spiked pulverizing apparatus.

COTTON HARVESTER.—Davis & Scott, Greensboro, N. C.—This invention relates to improvements in machines for gathering cotton, and consists in a receiving case, mounted on a truck, above the row of plants with two downward projecting plates, flaring outward at the front to gather the branches together, as the machine passes along, and hold them, and an air blowing apparatus, operated by the driving wheels or otherwise, which diffuses one or more strong blasts of air among the plants, at or near the bottom, in an upward direction, and detaches the ripe and loose cotton, and forces it into the receiver above, where it is retained by bars or grates which permit the escape of the air, but retain the fiber. The invention also consists in imparting a special direction to the blasts of air, as they leave the blast nozzles, whereby the detaching effect on the boles is intensified.

HEATING STOVES.—H. Besse, Delaware, Ohio.—This invention relates to improvements in heating stoves, open grates, and the like, and consists in the arrangement therewith on the bottom, one or more sides or parts thereof, and the top or double walls, forming heating chambers; and in providing in connection therewith cold air pipes, leading from the exterior of the building, under the floor or otherwise, to the said heating chambers, to supply fresh, cool air to be heated and discharged into the room, whereby it is designed to utilize a greater proportion of the heat developed than can be done by the present arrangement of stoves to give off the heat by radiation alone.

PEAT MACHINE.—Charles Luxton, Hudson City, N. J.—This invention relates to a new and useful improvement in machines for working peat and preparing it for fuel, and consists in operating a series of revolving cutters, or knives, in combination with a stationary bed, and in combination therewith conveyer wings for carrying the peat to and from the cutters; the whole inclosed in a suitably constructed cylindrical casing.

FLASK GUIDE.—Thomas S. Brown, Poughkeepsie, N. Y.—This invention relates to a new and useful improvement in the mode of guiding the parts (" cope" and " nowel ") of a foundery flask together, and consists in a triangular or polygonal guide pin, tapering on one side, and acted upon by a spring, so that the cope may be kept perfectly steady and closed back on the nowel, in the exact position it occupied when the pattern was molded.

FOLDING CONVERTIBLE CHAIR.—William B. Kimball, Peterborough, N. H. —The object of this invention is to construct a chair which may be folded up into a small space, and be converted from an ordinary rigid seated chair to a rocking chair and *vice versa*.

OSCILLATING COUCH SOFA FOR VESSELS.—L. D. Newell, New York city· —This invention relates to improvements in apparatus to be used on vessels at sea, to neutralize the oscillating motion of the vessel, and it consists in providing in the state rooms, saloons, cabins, and other parts of the vessel couches, sofas, and the like, suspended on hangings capable of universal motion, so that they will always maintain a horizontal position, irrespective of that of the ship; the said couches being preferably made round, or circular, and those placed in the state rooms being as large as may be contained within the walls of the rooms, and having circular seats within the shells which form the backs of the seats. The angular spaces in the corners of the square state rooms not occupied by the couches, are designed to be used for clothes closets, wash stands, and the like.

MACHINE FOR FORCING AND SPREADING LIQUIDS.—Wm. Eaton, Benn Ainsworth, and Geo. W. Scott, Blackstone, Mass.—This invention has for its object to construct a machine by means of which liquids can be forced in fine spray with great regularity, and suitable force, the machine being so arranged that the degree of power can be regulated at will. The invention is more particularly applicable to the moistening of wool, preparatory to the carding of the same.

RUFFLER AND PUFFER.—J. L. Eck, Kutztown, Pa.—This invention relates to improvements in ruffling and puffing attachments for sewing machines, and consists in attaching the presser to the arm supporting the same so as to form a yoke above the presser, and introducing therein a flat spring connected to the arm, and provided with an adjusting screw, all so arranged that the ruffling will pass through the said yoke under the spring, which may be adjusted for action upon thick or thin material, while the cloth passes under the presser in the usual way.

HOOP LOCK CUTTER.—Theodore Conklin, Fond du Lac, Wis.—This invention consists of an adjustable clamp for holding the hoop, guide springs for regulating the position before the hoop is clamped, an inclined sliding crotched knife for cutting the straight part of the lock, a swinging knife for cutting the curved angular wall of the notch, and an adjustable spring for governing the clampers at the side of the straight wall of the lock; all under such an arrangement that the knife for cutting the straight shoulder of the lock, and the clamper thereat, will be worked to accomplish its cutting, and withdrawn previous to the finishing of the operation of the other knife, by one and the same movement of a hand lever.

FLOUR AND MEAL CHEST.—John M. Dashiell, Decatur, Ill.—The object of this invention is to provide a convenient receptacle for meal, flour, and other articles for domestic use, with facilities for sifting and preparing the flour and meal for use, and it consists in a chest partitioned off into compartments, provided with a sieve and a receiving drawer.

COMBINED SQUARE, PLUMB LEVEL, PROTRACTOR, AND RULER.—J. A. Littlefield, Randolph, Mass.—This invention relates to a new and useful improvement in the combination of several useful and well-known tools or instruments in one.

LAMP WICK FEEDER.—George Cade, Long Branch, N. J.—This invention relates to improvements in apparatus for feeding up the wick to the flame as it burns away, and consists in an arrangement inside the wick tube, which is slotted from the bottom upward a suitable distance, of a toothed carrying plate adapted to engage the wick and force it upward, and in the application to the said plate of a lever for moving it up and down, the said lever being pivoted to a suitable support on the burner, and engaged with the lifting plate so as to be readily detached.

FANNING MILLS.—Jacob L. Runk and B. H. Tharp, Nashville, Ill.—This invention relates to improvements in fanning mills, and consists in the application to the upper feed shoe of an adjustable slide, arranged under the throat of the hopper, for regulating the feed; also, in the application to the said shoe of a rod of wire or other substance, projecting up through the throat for agitating the grain and chaff to prevent clogging, the said rod moving with the shoe. The invention also comprises an arrangement of sieves, and an adjusting valve whereby the grain may be separated, and two grades formed without changing the sieves.

MACHINE FOR MAKING STAPLES.—Charles W. Kennedy, Williamsburgh, N. Y.—This invention has for its object to furnish a simple, convenient, and effective machine for forming staples, which shall be so constructed as to feed the wire in and form the staples automatically, and at the same time, rapidly and well.

SELF-FEEDER FOR NAIL MACHINES.—James Nolan, Oxford, N. J.—This invention has for its object to improve the construction of the self-feeders of nail machines to prevent them from being broken should anything get beneath the barrel or get out of order.

FRUIT JAR.—T. C. Purdy, Janesville, Wis.—This invention relates to a new device for sealing fruit cans, and consists in the use of a wire yoke placed around the neck of a can, and provided with loops, to receive the ends of screws that projects from the cover. The latter is thus held down by being screwed to the wire yoke.

REVOLVING SWING.—Almeron Graves, Roscoe, Ill.—This invention is an improvement upon an invention for handling animals for slaughtering patented by same party February 18, 1868. The invention consists of a revolving derrick having radial arms, projecting about midway of its length, the latter being adapted to the support of sails above, and swings below, and capable of being used either with or without the sails, and adapted to discharge, upon occasion, the function of a clothes dryer.

Official List of Patents.

Issued by the United States Patent Office

FOR THE WEEK ENDING April 5, 1870.

Reported Officially for the Scientific American.

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Patent Solicitors, No. 37 *Park Row, New York*

101,409.—LAMP SHADE SUPPORTER.—J. B. Alexander, Washington, D. C.
101,410.—FAUCET.—John Ashcroft, New York city.
101,411.—ELASTIC GRADUATED SCALE.—R. M. Bache, Philadelphia, Pa.
101,412.—DIE FOR FORGING SHEAR BOWS.—A. R. Bailey, Plantsville, Conn.
101,413.—VAPOR BURNER.—S. D. Baldwin, Chicago, Ill.
101,414.—WASHING MACHINE.—Joseph Balsley, Bedford, Ind.
101,415.—APPARATUS FOR GENERATING CARBONIC ACID.—Benjamin Bates, Baltimore, Md.
101,416.—BRICK KILN.—Oliver Bennett, Boston, Mass. Antedated April 4, 1870.
101,417.—TOBACCO PIPE.—Z. R. Bennett, Williamsburgh, N. Y., assignor to himself and L. F. Reed, New York city.
101,418.—BREECH-LOADING FIRE-ARM.—Hiram Berdan (assignor to The Berdan Fire-Arms Manufacturing Company), New York city. Antedated March 21, 1870.
101,419.—CHAMBER VESSEL.—C. H. Berry, East Somerville, Mass.
101,420.—HEATING STOVE.—H. Besse, Delaware, Ohio.
101,421.—LOCK NUT.—Amos G. Binns, Pittsburgh, Pa.
101,422.—HOT AIR FURNACE.—Lansing Bonnell, Milwaukee, Wis. Antedated March 19, 1870.
101,423.—FLOUR SIFTER, COLANDER, AND STRAINER.—A. T. Boon and Lucien Mills, Galesburg, Ill.
101,424.—ICE PICK.—Edward Brown, Green Point, N. Y. Antedated March 23, 1870.
101,425.—STOP VALVE.—Silas H. Brown, Troy, N. Y.
101,426.—FLASK GUIDE.—Thomas S. Brown, Poughkeepsie, N. Y.
101,427.—LAMP WICK FEEDER.—George Cade, Long Branch, N. J.
101,428.—STOVE LEG.—Edward Card, Providence, R. I. Antedated March 21, 1870.
101,429.—WAGON TONGUE.—E. P. Carter, Arcade, N. Y.
101,430.—FASTENING FOR PAILS, CANS, ETC.—J. K. Chace, New York, assignor to himself and S. A. Ilsley, Brooklyn, N. Y.
101,431.—MACHINE FOR GRINDING SCREWS.—Edwin Chambers and Cyrus Chambers, Jr., Philadelphia, Pa. Antedated March 24 1870.
101,432.—BRICK MACHINE.—Frederic L. Clarke, Oakland, Ill.
101,433.—STEAM GENERATOR.—Jonathan M. Clark, New York city.
101,434.—STEAM GENERATOR.—Jonathan M. Clark, New York city.
101,435.—SULKY PLOW.—John H. Cole, Vacaville, Cal.
101,436.—MACHINE FOR CUTTING LOCKS IN HOOPS.—Theodore Conklin, Fond Du Lac, Wis.
101,437.—RAILROAD STATION INDICATOR.—Edward Conley, Cincinnati, Ohio.
101,438.—FLOUR AND MEAL CHEST.—J. M. Dashiell, Decatur, Ill.
101,439.—COTTON HARVESTER.—James Davis, Jr., and David Scott, Jr., Greensborough, N. C.
101,440.—WINDOW SHADE FIXTURE.—D. W. De Forest (assignor to Richard Oliver), Brooklyn, N. Y.
101,441.—WASHING MACHINE.—John K. Derby, Jamestown, N. Y.
101,442.—TAPE LINE BOX.—Chas. E. Donnellan, Indianapolis, Ind.
101,443.—CHIMNEY COWL.—Nathan Douglas, Goshen, Ind., assignor to himself and Frank Douglas, Norwich Conn.
101,444.—BUTTER WORKER.—O. L. Dow, Hancock, N. H.
101,445.—HYDRAULIC ENGINE.—William Eaton, Benn Ainsworth, and G. W. Scott, Blackstone, Mass.
101,446.—RUFFLING ATTACHMENT FOR SEWING MACHINE.—J. L. Eck (assignor to himself and S. S. Schmehl), Kutztown, Pa.
101,447.—LATHE FOR TURNING OVALS.—Rudolph Eickemeyer, Yonkers, N. Y.
101,448.—KNIFE, NUT-CRACKER, AND PICKER.—Geo. A. Fairfield, Hartford, Conn.
101,449.—HOT BLAST OVENS OR FURNACES.—E. M. Ferguson, Brady's Bend, Pa.
101,450.—LIFTING JACK.—L. W. Fifield (assignor to Enoch Earle and L. K. Davis), Worcester, Mass.
101,451.—DUMPING PLATFORM.—R. M. Fish, Glenwood, Iowa.
101,452.—MELODY ATTACHMENT.—Carl Fogelberg, Boston, Mass.
101,453.—CHURN.—Albion W. Foster, Millbridge, Me.
101,454.—LIFTING JACK.—L. P. Garcin (assignor to himself and J. D. Hooker), San Francisco, Cal.
101,455.—MACHINERY FOR MAKING PAPER BOXES.—Frederick Gates, Vineland, N. J., assignor to Wm. Gates, Frankfort, N. Y.
101,456.—LASTING MACHINE.—Karl Grassau, Virginia City, Nevada.
101,457.—PENCIL HOLDER.—Annie J. Hall, San Francisco, Cal.
101,458.—DRYER.—Thomas S. Harrison, Philadelphia, Pa. Antedated March 25, 1870.
101,459.—ANIMAL TRAP.—Eder E. Haughwout, New York city.
101,460.—HARVESTER CUTTER.—Ira A. Hebbard (assignor to E. F. Hebbard), Rochester, N. Y.
101,461.—WATER-PROOF COMPOSITION FOR HARNESS, LEATHER, ETC.—John Herold, Omaha, Nebraska.
101,462.—PLANING MACHINE.—Alfred M. Hills, Lowell, Mass.
101,463.—RECLINING CHAIR.—W. C. Hornfager and Edmond A. Warren, Brooklyn, N. Y.
101,464.—CANNON PINION FOR WATCHES.—Elias H. Hull Warren, Ohio.
101,465.—SAW MILL.—Elias H. Hull, Warren, Ohio.
101,466.—HAND DRILLING MACHINE.—James E. Hunter, North Adams, Mass.
101,467.—CARRIAGE CLIP.—Leonard A. Johnson, Candor, N. Y.
101,468.—FINISHING CULTIVATOR.—Benjamin Johnston, New Iberia, La.
101,469.—WELL POINT.—C. C. Jones, Portland, Me.
101,470.—REFLECTOR FOR STREETS.—A. K. Grim and A. D. Moore, San Francisco, Cal.
101,471.—STAPLE MACHINE.—Charles W. Kennedy, Williamsburgh, N. Y.
101,472.—FOLDING CONVERTIBLE CHAIR.—William B. Kimball, Peterborough, N. H.
101,473.—MACHINE FOR THE MANUFACTURE OF FELTED FABRICS FOR ROOFING, ETC.—Samuel Kingan, New York city, administrator of the estate of James Anderson, deceased.
101,474.—POTATO DIGGER.—Melvin W. Knox, Sheridan, N. Y.
101,475.—COUNTER SHOW CASE.—George D. Leonard, New York city. Antedated January 6, 1870.
101,476.—BASE BURNING STOVE.—Dennis G. Littlefield, Albany, N. Y., and Grove H. Johnson, Erie, Pa.
101,477.—COMBINED SQUARE, PROTRACTOR, LEVEL, ETC.—J. A. Littlefield, Randolph, Mass.
101,478.—PEAT MACHINE.—Charles Luxton, Hudson City, N. J.
101,479.—MACHINE FOR SCOURING AND BURNISHING METALS.—James B. Lyons, Milton, Conn.
101,480.—HAND SEED PLANTER.—J. T. Macomber, Grand Isle, Vt.
101,481.—SAW FRAME.—Charles Majer, Williamsburgh, N. Y,
101,482.—SELF-TIGHTENING BUCKLE.—Matthias Marvin, Salem, Oregon.
101,483.—BAIL EAR.—William D. Mason and Arthur T. Rice. Chicago, Ill.
101,484.—WATER ELEVATOR.—Morton S. McAtee, Chester, Ill.
101,485.—PLUNGER FOR GLASS MOLDS.—John McCord (assignor to himself and John Bruce), East Birmingham, Pa.
101,486.—SASH FASTENER.—John S. McGlumphy, Wind Ridge, Pa.
101,487.—GOVERNOR FOR STEAM ENGINE.—Hugh Dunbar McMaster and Abraham Dale, Guilford, Ireland.
101,488.—STEAM HEATING PIPES.—William Mendham (assignor to Cyrus Chambers, Jr., and Edwin Chambers), Philadelphia, Pa. Antedated March 29, 1870.
101,489.—EXTENSION BED.—Frederick Menzer, San Francisco, Cal.
101,490.—BISCUIT PAN.—John C. Milligan, Brooklyn, N. Y.
101,491.—APPARATUS FOR LIGHTING GAS BY ELECTRICITY.—Walter J. Morris and William J. Reid, New York city.
101,492.—SAW HANGING.—Lawrence Morrison and Amos G. Harms, Allegheny City, Pa.
101,493.—WALKING-BEAM AND SUCKER-ROD CONNECTIONS FOR DEEP WELLS.—Marcellus A. Morse, Titusville, Pa.
101,494.—HOP PICKER.—Myron Moses, Malone, N. Y. Antedated April 1, 1870.
101,495.—MARINE FURNITURE.—L. D. Newell, New York city.
101,496.—FEEDING APPARATUS FOR NAIL MACHINES.—Jas. Nolan (assignor to himself and E. T. Henry), Oxford, N. J.
101,497.—MITER MACHINE.—John Nonnenbacher, New York city.
101,498.—HORSE POWER.—George Oerllein, Utica, Minn.
101,499.—POTATO DIGGER.—Oliver Patterson, South Dansville, N. Y.
101,500.—APPARATUS FOR DISINTEGRATING ORES.—Almarin B. Paul, San Francisco, Cal.
101,501.—SEALING APPARATUS FOR PIPE-JOINT COUPLINGS.—Charles Perkes, Philadelphia, Pa.
101,502.—WOOD TURNING LATHE.—Oliver H. Perry, Golconda, Ill.
101,503.—ADJUSTING SLIDE FOR CHAINS.—Robert James Pond, Morrisania, N. Y., assignor to Jahne, Smith & Co., New York city.
101,504.—MOLDING SASH WEIGHTS.—William W. Pullis, St. Louis, Mo.
101,505.—FRUIT JAR.—Thomas C. Purdy, Janesville, Wis.
101,506.—GLOVE.—John H. Putman, Gloversville, N. Y.
101,507.—MODE OF SECURING HORSE POWERS TO THE GROUND.—Francis W. R. Burlington, assignor to I. B. Buell, Union, Mich.
101,508.—MACHINE FOR SCOURING AND SETTING OUT LEATHER.—A. W. Reid (assignor to himself and W. H. Rugg, Schenectady, N. Y.
101,509.—REVOLVING PLOW COLTER.—Merritt Richards, Princeton, Ill.
101,510.—COMPOUND BLOWER.—A. K. Rider (assignor to himself, C. H. De Lamater, and G. H. Reynolds), New York city.
101,511.—WASHING MACHINE.—Wm. Riley, Madison county Miss.
101,512.—GLASS LAMP.—D. C. Ripley, Jr. (assignor to Ripley & Co.), Birmingham, Pa.
101,513.—MACHINE FOR MAKING HORSESHOES.—L. D. Roberts, Cleveland, Ohio.
101,514.—FANNING MILL.—J. L. Runk and B. H. Tharp, Nashville, Ill.
101,515.—HORSE COLLAR.—Henry Sanders, Utica, N. Y.
101,516.—TIN PAIL.—Hugh Sangsters, Buffalo, N. Y.
101,517.—COFFEEPOT.—S. T. Savage (assignor to himself and D. S. Quimby, Jr.), Brooklyn, N. Y.
101,518.—CARRIAGE PROP.—Leonard Sawyer, South Amesbury, Mass.
101,519.—SADIRON HEATER.—William Scarlett, Aurora, Ill.
101,520.—CARRIAGE CUTTER.—John D. Schaub, Birmingham, Pa.
101,521.—CARRIAGE AXLE.—Francis Scherb, New York city.
101,522.—HARROW AND EARTH CUTTER.—John Schroeffel and Wm. Dell, Allegheny City, Pa.
101,523.—SKATE.—G. V. Scobey, Waterloo, assignor to himself and Reuben Wood, Syracuse, N. Y.
101,524.—HORSE HAY FORK.—Elijah U. Scoville, Manlius, N. Y.
101,525.—BRICK AND TILE MACHINE.—George Scott, Philadelphia, Pa., assignor to himself, Charles Melcher, John Melcher, G. W Melcher, and W. H. Melcher.
101,526.—SPRING BED BOTTOM.—D. N. Sellig, Newburg, N. Y.
101,527.—COVERING FOR STEAM BOILERS, ETC.—J. E. Sharp, Eleazer Ainsworth, and F. A. Sabbaton, Troy, N. Y.
101,528.—PATTERN FOR SHOES.—Elias Shopbell, Ashland, Ohio.
101,529.—DIE FOR MAKING CHORD-BAR HEADS.—F. J. Smith, Chicago, Ill.
101,530.—SEPARATOR.—B. H. Snavely, Penn township, Pa.
101,531.—SAW MILL.—H. F. Snyder and G. S. Snyder, Williamsport, Pa.
101,532.—FRICTION CALENDER ROLLS FOR PAPER.—W. H. Soley and George Stites, Philadelphia, Pa.
101,533.—FAUCET.—Thos. Somerville (assignor to himself and Robert Leitch), Washington, D. C.
101,534.—SODA FOUNTAIN.—S. B. Spring, Geneva, Ohio.
101,535.—ORNAMENTAL SCROLL TYPE.—Henry Stephenson, Wm. Thompson, and W. G. Blake, Sheffield, England, assignors to F. W. Griffith and George P. Byrne, New York city, Antedated March, 18, 1870.
101,536.—CULTIVATOR.—Garland B. St. John, Kalamazoo, Mich. Antedated April 1, 1870.
101,537.—ATTACHMENT TO SEEDING MACHINE.—G. B. St. John, Kalamazoo, Mich.
101,538.—HORSESHOEING TOOL.—Robert Stout, Matteawan, N. Y.
101,539.—GANG PLOW.—J. W. Sursa, San Leandro, Cal.
101,540.—SULKY-HARROW AND SEEDER COMBINED.—A. L. Taveau, Chaptico, Md.
101,541.—NUT LOCK PLATE.—E. D. Taylor (assignor to himself and David Cohn), Hornellsville, N. Y.
101,542.—COUNTER-KNIFE.—John Teed, Reading, Pa.
101,543.—CAR COUPLING.—James Temple (assignor to himself, Wm. Temple, and John Temple), Belle Fonte, Pa.
101,544.—PROCESS AND APPARATUS FOR SUPPLYING PURE WATER TO BUILDINGS.—John A. Thompson, Auburn, assignor to American Water Purifying Company, Buffalo, N. Y. Antedated March 25, 1870.
101,545.—EXTENSION TABLE.—Smilie Tilton, Alton, N. H.
101,546.—PAPER BOX.—John W. Tuttle, Newton Corner, Mass.
101,547.—HARROW.—Wm. Tuttle, Fayette, Miss.
101,548.—WOOD-TURNING LATHE.—J. J. Urmston, Rahway, N. J.
101,549.—SHELF FOR OVENS OF COOKING-STOVES.—S. S. Utter, New York city.
101,550.—FEED FOR IRON PLANERS.—H. B. Weaver (assignor to G. S. Lincoln and C. L. Lincoln), Hartford, Conn.
101,551.—LUBRICATING JOURNALS AND BEARINGS.—Isaac P. Wendell (assignor to himself and Stephen P. M. Tasker), Philadelphia Pa.
101,552.—MANUFACTURE OF ARTICLES OF COMPRESSED WOOD.—S. P. Wheeler (assignor to himself and S. B. Henry), Bridgeport, Conn.
101,553.—PROCESS OF TREATING WOOD.—S. P. Wheeler (assignor to Samuel B. Henry), Bridgeport, Conn.

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101,554.—Mowing Machine.—J. D. Wilber, Poughkeepsie, N. Y.
101,555.—Combined Distilling Apparatus.—Ludwig Wolff (assignor to himself, D. G. Rush, H. J. Pahlman, and Charles Welsh), Chicago, Ill.
101,556.—Machine for Making Cornice Moldings.—C. L. Wood and C. A. Sheridan, Cleveland, Ohio.
101,557.—Apparatus for Generating and Carbureting Hydrogen Gas.—J. S. Wood (assignor to himself and J. J. Carberry), Philadelphia, Pa.
101,558.—Generating Hydrogen and Hydrocarbon Gas.—Joseph S. Wood (assignor to himself and John J. Carberry), Philadelphia. Pa.
101,559.—Grinding Machine.—T. H. Worrall, East Blackstone, Mass.
101,560.—Thill Coupling.—Edmund Yeiser, Newmanstown, Pa. Antedated March 23, 1870.
101,561.—Curling Rod for Paper Cigar Lighters.—W. D. Young, South Pittsburgh, Pa.
101,562.—Preparing Tomatoes and other Fruits and Vegetables to be used as Food.—Charles Alden, Newburg, N. Y.
101,563.—Car Spring.—T. F. Allyn, Nyack, N. Y.
101,564.—Door Lock.—W. H. Andrews (assignor to Burton Mallory), New Haven, Conn.
101,565.—Die for Forming Sleeve Buttons.—Henry Ansley, Washington, D. C.
101,566.—Hay Press.—G. H. Aylworth, Brighton, Ill.
101,567.—Tablet for Tombs.—H. F. Bailey, Amsterdam, N. Y.
101,568.—Gun-Sight.—H. B. Barber, Scott, N. Y.
101,569.—Harness.—E. L. Basnet, Morgantown, West Va.
101,570.—Gate.—Aquila Becraft, Jacksonville, Ill.
101,571.—Pruning Shears.—George Bergner, Washington, Mo.
101,572.—Construction of Metallic Cornice.—Joseph M. Blackburn, C. L. Wood, B. K. Price, and Cornelius A. Sheridan, Cleaveland, Ohio.
101,573.—Ironing Machine.—George Boxley, Troy, N. Y.
101,574—Sulky Plow.—J. G. Boyd (assignor to himself and Allen Bailey), Decater, Texas.
101,575.—Sewer Grate.—Z. L. Bragdon, Bangor, Me.
101,576.—Portable Swing.—Mary D. Brine, Chicago, Ill.
101,577.—Tinman's Machine.—Charles Brombacher, Tarrytown, N. Y.
101,578.—Thrashing Machine.—William H. Butterworth, Trenton, N. J.
101,579.—Water Wheel.—John Buzbo, Moorestown, N. J.
101,580.—Device for Ringing Street-Car Bells.—Chas. Carr, Boston, Mass. Antedated April 1, 1870.
101,581.—Horseshoe.—Ebenezer Cate, Watertown, Mass.
101,582.—Refrigerator.—A. J. Chase, Boston, Mass.
101,583.—Registering Steam Gage.—Elijah Clark (assignor to United States Steam Gage Company), Louisville, Ky.
101,584.—Lamp.—H. M. Clark (assignor to himself, Elisha J. Barnard, and Charles Blanchard), Meriden, Conn.
101,585.—Lawn Mower.—C. M. Clinton (assignor to himself and A. N. Gregg), Ithaca, N. Y.
101,586.—Wagon Axle.—Thomas M. Cluxton, Rising Sun, Ind.
101,587.—Molding and Clarifying Horn.—E. F. Coffin, Newburyport, Mass.
101,588.—Refrigerator.—E. S. Colton (assignor to the Colton Refrigerator Company), Boston, Mass.
101,589.—Cow Milker.—L. O. Colvin, New York city. Antedated March 24, 1870.
101,590.—Wood Pavement.—Turner Cowing, San Francisco, Cal., assignor to T. E. Brown, Memphis, Tenn.
101,591.—Garment Dummy.—A. M. Davis, Washington, D. C.
101,592.—Washing Machine.—Cyrus Dean, Buffalo, N. Y.
101,593.—Shoe Trimming.—Wm. T. Demarest, Brooklyn, N. Y.
101,594.—Composition Roofing, Paving, etc.—E. J. De Smedt (assignor to New York Improved Anthracite Coal Company), New York city
101,595.—Lifting Clamp for Pumps.—Wm. H. Downing, Pioneer, Pa. Antedated March 29, 1870.
101,596.—Revolving Center Rest for Wood Lathes.—H. J. Durgin (assignor to James Chase), Rochester, N. Y.
101,597.—Fire Kindling.—G. W. Eldridge, South Chatham, Mass.
101,598.—Ticket Punch.—Robert Engels, Philadelphia, Pa.
101,599.—Churn.—T. R. Evans, Blacksburg, Va.
101,600.—Spring Bed Bottom.—Matthew Faloon, Bloomington, Ill.
101,601.—Wire Tightener for Wire Fence.—F. Fanning, Atchinson, Kansas.
101,602.—Galvanic Shoe Sole.—Joseph Fanyou, Bridgeport, Conn.
101,603.—Adjustable Elbow Joints for Water Pipes.—J. D. Field, Wataga, Ill. Antedated April 1, 1870.
101,604.—Adhesive Postal and Revenue Stamp.—A. C. Fletcher, New York city. Antedated October 5, 1869.
101,605.—Melody Attachment for Organs, etc.—Carl Fogelberg, New York city.
101,606.—Fastening for Fruit Jars.—Wm. Galloway, Philadelphia, Pa.
101,607.—Padlock.—C. T. Gibson (assignor to himself and S. E. Kirk), Baltimore, Md. Antedated March 29, 1870.
101,608.—Brick Mold.—M. T. Glimsdal, Rockford, Ill.
101,609.—Revolving Swing.—Almeron Graves, Roscoe, Ill.
101,610.—Cotton Gin.—Richard R. Gwathmey (assignor to himself and C. W. Matthews), Philadelphia, Pa.
101,611.—Railway Rail.—J. C. Hagan, Nashville, Tenn.
101,612.—Steam Heater.—F. P. Hallberg, Gottenburg, Sweden.
101,613.—Ice-Cutting Machine.—V. H. Halleck, Queens, N. Y., assignor to himself, Curtis Stanton, and James R. Dixon, New York city.
101,614.—Self-feeding Drill.—J. H. Hanes, Cape May, N. J.
101,615.—Bread Machine.—John E. Hawkins, Lansingburg, N. Y.
101,616.—Brick Machine.—C. V. Hemenway (assignor to himself and A. A. Powers), New London, Ohio.
101,617.—Direct-Acting Compound Steam Engine.—Wm. H. Henderson, Philadelphia, Pa.
101,618.—Closet for Cake.—George A. Higgins, New York city
101,619.—Horse Collar.—George Horter (assignor to himself, T. K. Peterson, and E. C. Fenner), New Orleans, La.
101,620.—Mouse Trap.—A. H. Hotchkiss, Sharon, Conn.
101,621.—Furnace.—John Hulbert, Jr., Richmond, Ind.
101,622.—Boiler and Washing Machine.—D. H. Hull (assignor to himself and J. B. Savage), Plantsville, Conn.
101,623.—Horse Collar.—Robert Humphrey, West Troy, N. Y.
101,624.—Manufacture of Steel.—O. E. Hunter, Keyport, N. J., assignor to Adeline M. Jenkins, administratrix, and Henry M. Jenkins, and J. W. Barret, administrators of T. H. Jenkins, deceased, all of New York city.
101,625.—Composition for the Manufacture of Friction Matches.—J. J. Karlen, Erlenbach, Switzerland.
101,626.—Field Roller.—A. S. Keagy, Harristown, Ill.
101,627.—Blotting Pad.—J. M. Keep, New York city.
101,628.—Folding Chair.—Frederick Kilian, New York city.
101,629.—Picture Cord.—Tobias Kohn, Hartford, Conn.
101,630.—Scrubbing Brush.—Benj. F. Koller, Shrewsbury, Pa.
101,631.—Storing Power in Pneumatic Locomotives.—H. F. C. Krumme, Ridgeway, Pa.
101,632.—Permutation Lock.—John H. Larry, Weston, Mass.
101,633.—Weighing Faucet.—Daniel Lesh, Jr., Liverpool, Pa.
101,634.—Variable Cut-off Valve Gear.—N. K. Lynch, New York city.
101,635.—Roofing.—T. A. Makibbin (assignor to himself, W. M. Pusey, and Seelye Richmond), Annapolis, Md.
101,636.—Pressure Gage.—J. W. Maloy (assignor to the Maloy Pressure-Gage Co.), Boston, Mass.
101,637.—Cartridge Ejector.—John M. Marlin, Hartford, Conn
101,638.—Flooring.—Charles J. McAlister, Chicago, Ill. Antedated March 24, 1870.
101,639.—Brake to Prevent Reverse Motion in Driving Wheel in Sewing Machines.—E. D. McIntosh (assignor of one third of his right to E. W. Anderson), Washington, D. C.
101,640.—Ditching Machine.—S. P. McKelvey, Farmer City, assignor to himself and G. W. Snook, Saybrook, Ill.
101,641.—Manufacture of Safety Match.—L. Otto P. Meyer, Newtown, Conn.
101,642.—Hame Fastener.—Chas. H. Miller, Buffalo, N. Y. Antedated April 1, 1870.
101,643.—Washing Machine.—John Miller, Youngstown, Ohio.
101,644.—Sewing Machine for Boots and Shoes.—Daniel Mills, New York city.
101,645.—Fireplace.—James Moore, Ergineth, Ireland.
101,646.—Horse Hay Rake.—John H. Morris, Maquoketa, Iowa.
101,647.—Beehive.—Marcus Morton, Gallatin, Mo.
101,648.—Furniture Pad.—William B. Moses, Washington, D. C.
101,649.—Hand Stamp.—Albert L. Munson, New Haven, Conn.
101,650.—Machine for Crozing Barrels.—Hiram Nelson, (assignor to himself and Alpheus Dolloff), Lake Village, N. H.
101,651.—Flood Gate.—A. E. Noble, La Motte, Iowa.
101,652.—Gridiron Case.—M. V. Nobles, Elmira, N. Y.
101,653.—Lath Machine.—Josiah Oothoudt, Minneapolis, Minn.
101,654.—Desulphurizing Ores.—John F. Osgood, Boston, Mass.
101,655.—Belt Awl.—Frederic I. Palmer, Youngstown, Ohio.
101,656.—Trace Fastening.—Oliver Palmer, Cincinnati, Ohio.
101,657.—Hitching Post.—Walter W. Powers, Belleville, N. Y.
101,658.—Puddling and other Furnaces.—T. E. Purchase (assignor to himself and S. T. Hodgkins), Reading, Pa.
101,659.—Harvester.—Eli B. Rice, Madison, Wis.
101,660.—Spring for Bed.—Charles Rich (assignor to himself and D. S. Mallory), Poughkeepsie, N. Y.
101,661.—Tanning by Infiltration.—L. T. Robertson, New York city.
101,662.—Hitching Post.—J. S. Rohrer, Lancaster, Pa.
101,663.—Vehicle.—Elias Rowe, Vandalia, Ill.
101,664.—Grain Separator.—Lewis Royer, Royerton, Ind.
101,665.—Boat Detaching Apparatus.—Wm. S. Ryerson and George Stancliff (assignors to themselves, O. T. McIntosh, Amos L. Tripp, and Charles Chambers, New York city.
101,666.—Churn.—J. B. Schuette, Lockington, Ohio.
101,667.—Car Brake.—G. H. Seymour, Newark, Ohio.
101,668.—Steam Radiator.—Joseph Shackleton, Rahway, N. J.
101,669.—Steam Heater.—Joseph Shackleton, Rahway, N. J.
101,670.—School Desk.—Calvin W. Sherwood, Chicago, Ill.
101,671.—Chair Seat.—C. D. Smith (assignor to himself and P. C. Sawyer), Templeton, Mass.
101,672.—Teapot.—Thomas Smith, Jr., Boston, Mass.
101,673.—Reversible Latch.—William B. Smith, Bramford, Conn.
101,674.—Nut Lock.—C. S. Southwick and D. H. Barker, Newport, R. I.
101,675.—Broom.—Greenleaf Stackpole, Elizabeth, N. J.
101,676.—Summer Cooking Furnace.—Rufus O. Stevenson, Baltimore, Md.
101,677.—Carpet Stretcher.—G. W. Story, Kansas City, Mo.
101,678.—Suspension Bath Tent.—H. N. Taft, Sag Harbor, N. Y.
101,679.—Composition for Cleaning Plate and Glass.—Hermann Teats, Ann Arbor, Mich.
101,680.—Tag Holder.—Edgar C. Ten Eyck, West Meriden, Conn.
101,681.—Hoisting and Lowering Apparatus.—Hamilton E. Towle, New York city.
101,682.—Ice Machine.—D. K. Tuttle and Orazio Lugo, Baltimore, Md.
101,683.—Hot Air Furnace.—J. S. Van Buren, Green Island, N. Y.
101,684.—Lock.—Edward Voight and Philip P. Mathes, Philadelphia, Pa.
101,685.—Vegetable Washer.—Hiram J. Wattles, Rockford, Ill.
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101,696.—Brick Machine.—Charles T. Wrightington, Boston, Mass.
101,697.—Time Indicator for Letter Boxes.—James T. Young, Washington, D. C.

REISSUES.

3,902.—Coal Scuttle.—James Edgar, Newark, N. J., assignee of Wm. Miller.—Patent No. 37,871, dated March 10, 1863.
3,903.—Mode of Ornamenting.—Henry Harrop, Hoboken, N. J.—Patent No. 46,354, dated Feb. 14, 1865.
3,904.—Steam Boiler.—Hugh Leslie, Jersey City, N. J.—Patent No. 43,417, dated July 4, 1864.
3,905.—Tile Machine.—J. W. Penfield, Cleveland, Ohio.—Patent No. 98,519, dated Jan. 4, 1870.
3,906.—Skate.—J. L. Plimpton, New York city.—Patent No. 37,305, dated Jan. 6, 1863.
3,907.—Manufacture of Paper.—The Okra Paper Company, New York city, assignees of J. B. Reed.—Patent No. 51,571, dated Dec. 26, 1865.
3,908.—Coffee Strainer.—E. P. Woods, Daniel Sherwood, and C. H. Latham, Lowell, Mass., assignees of Daniel Sherwood.—Patent No. 32,791, dated July 9, 1861.
3,909.—Reversible Knob Latch.—The Norwalk Lock Co., South Norwalk, Conn., assignees of Henry H. Elwell.—Patent No. 39,280, dated July 21, 1863.

DESIGNS.

3,947.—Center Piece.—Henry Berger, New York city.
3,948.—Ornamental Letter.—W. H. Clendinen, Baltimore, Md.
3,949.—Spool for Thread.—Hezekiah Conant, Pawtucket, R. I.
3,950.—Pruning Shear.—Charles Condon, Rochester, N. Y.
3,951.—Cooking Stove.—William C. Davis, Cincinnati, Ohio.
3,952.—Harness Mounting.—Charles Eisele, Newark, N. J.
3,953.—Bracket.—M. D. Jones, Somerville, Mass.
3,954.—Ornamentation of Glass Ware.—W. M. Kirchner (assignor to Bakewell, Pears & Co.). Pittsburgh, Pa.
3,955.—Brake Wheel.—Anson Merriman, New York city.
3,956 to 3,958.—Floor Cloth Pattern.—Charles T. Meyer, Newark, N. J., assignor to Edward C. Sampson, New York city. Three Patents.
3,959.—Soda-Water Fountain.—Andrew J. Morse, Boston, Mass.
3,960.—Sprig of Artificial Flowers.—L. D. Newell, New York city.
3,961.—Tobacco Pipe.—Goldsbury H. Pond, Rutland, Vt.
3,962.—Frame for Containing Stationary Articles.—Charles H. Wight, Baltimore, Md. Antedated March 19, 1870.

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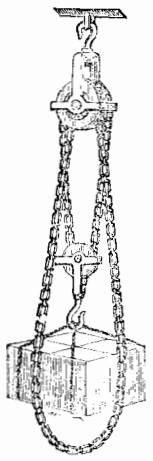

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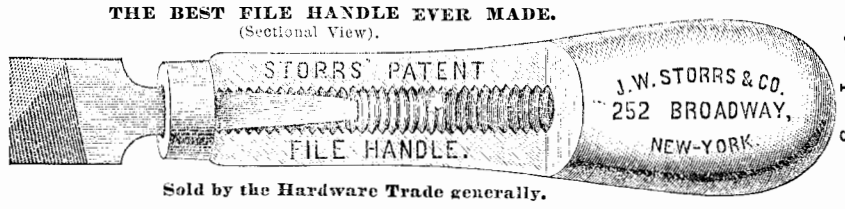

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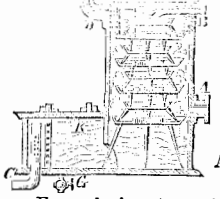

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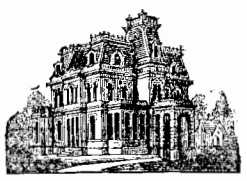

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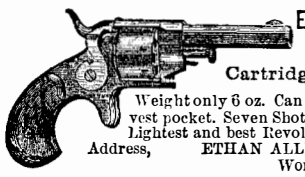
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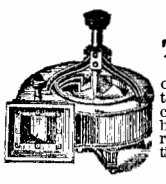
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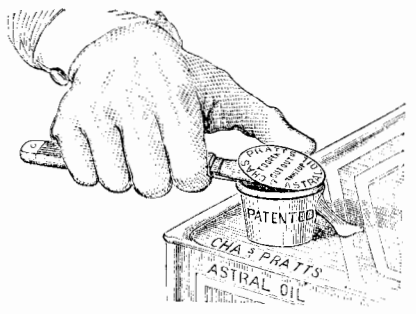

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